OCTOBER 1955

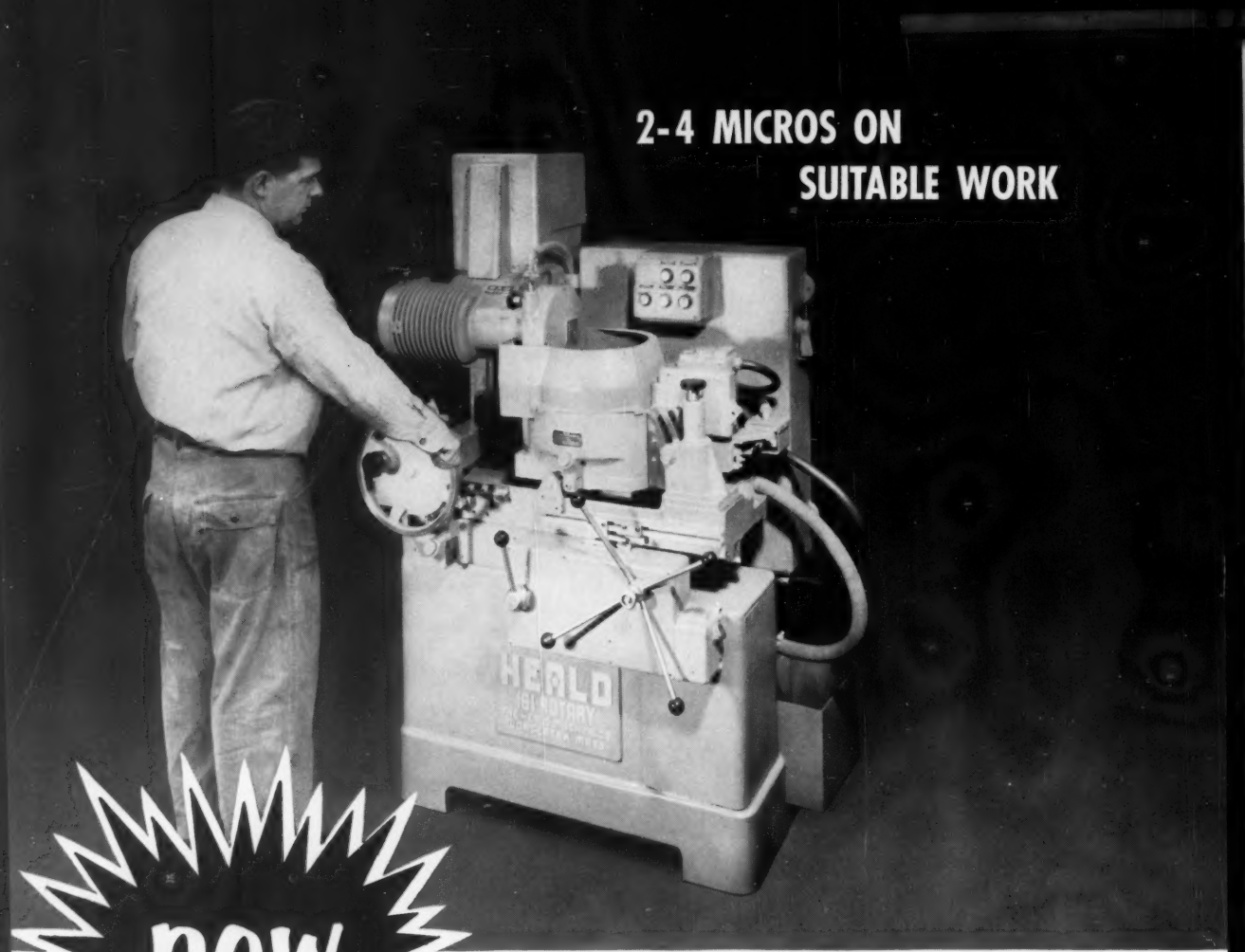
MACHINERY

M-R-C

SUPER-PRECISION BEARINGS

M-R-C, long known for leadership in the field of Super-Precision Ball and Roller Bearings, is now in full production of Instrument Bearings of Super-Precision quality.

MARLIN-ROCKWELL CORPORATION Executive Offices: JAMESTOWN, N. Y.



new

HEALD MODEL 161 ROTARY

provides new precision and economy for surface grinding SMALL PARTS

- Manual or Power Reciprocation
- Dry or Wet grinding
- Simple Mechanical Operation
- Grinds Flat, Convex or Concave
- Extremely Low Microinch Finish
- 6" Magnetic Chuck
- Extra Rigidity and Weight
- More Power to Wheelhead
- Column-Type Construction
- Moderate Cost

This completely new column-type Rotary is ideally suited to the general run of small surface grinding work — permitting greater accuracy and better finish than heretofore readily obtainable from equipment of this small size and moderate cost. On display at the Machine Tool Show, the Model 161 consistently turned out hardened steel gear cutters with concave faces ground to a 2-4 microinch finish.

Choice of manual or automatic power table reciprocation permits maximum operating efficiency on individual parts, small lots or long run jobs. Other outstanding features of this compact, versatile surface grinding machine are listed at the left. The bulletin mentioned below will give you the complete story.

Heald also offers two other sizes of high-precision, column-type Rotaries — the Model 261 for medium size work and the big, heavy-duty Model 361 for large work. Information will be gladly sent on request.

For profitable precision finishing on any type of work, IT PAYS TO COME TO HEALD!

Write today for your copy of Bulletin 2-161-M.

THE **HEALD** MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

HEALD ®

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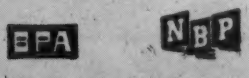

MACHINERY

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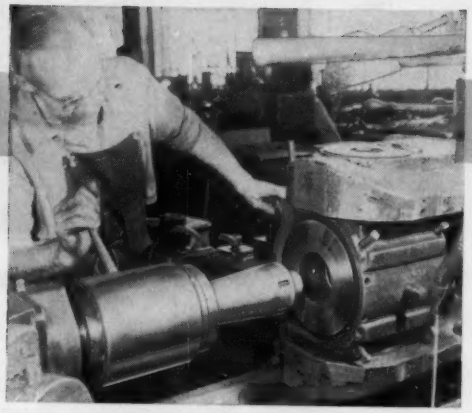
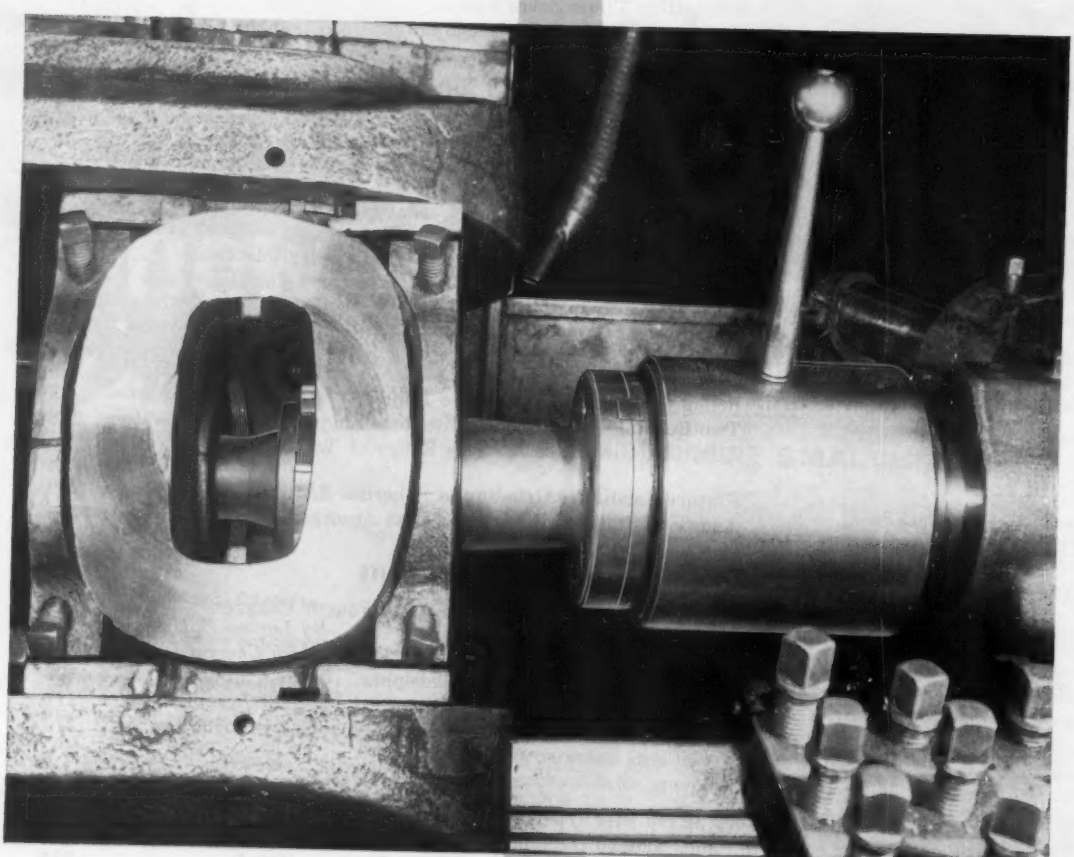




tapping threads from inside out

Seats are *tapped* in gate valves by using LANDIS Valve Taps, even though the diameter of the thread exceeds that of the valve port.

The use of a 6VB LANDIS Valve Tap at the Kerotest Mfg. Co., Pittsburgh Pa., illustrates the method and results of this operation. Specifications require 5" 12-pitch UN threads cut 5/8" long to Class 3 fit in 4" steel body castings.

Even though the seat thread diameter exceeds that of the valve port, the "collapsing action" of the tap (which withdraws the chasers into the head) gives sufficient clearance to move the tap into the port. The chasers are then expanded (from 3/4" on smaller taps to 2" on larger sizes) within the valve body, and threads are tapped outward as the lathe carriage is moved rearward by the leadscrew. (Note: Special chasers are available on certain of these operations that enable threading the opposing seats without removing the tap from the valve body.) After completing the thread, the tap is again collapsed and withdrawn.

Threads are cut at 12 R.P.M., and 100 threads are completed before regrinding the chasers. Each set of chasers produces an average of 700 pieces, excellent life with the short throat or chamfer required in this particular operation. Operation of the tap is by hand, and the valve body must be indexed 180° to thread the opposing seat.

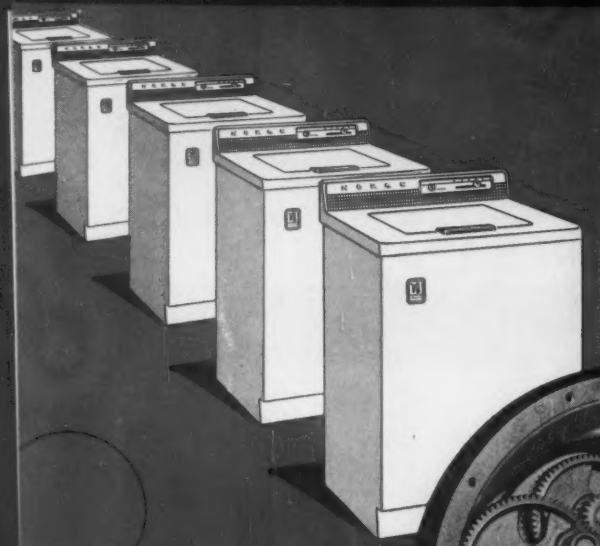
LANDIS Valve Taps are available for diameters from 2" to 24", and each tap body can be equipped with tap heads of various sizes to thread many different seat diameters. Note that these taps feature a tapered head, of great value where valve seats are inclined at an angle to the port opening. This allows tipping the valve body into threading position after the tap has entered the port. More information on request—please send drawings.

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT CUTTING - TAPPING - GRINDING - ROLLING

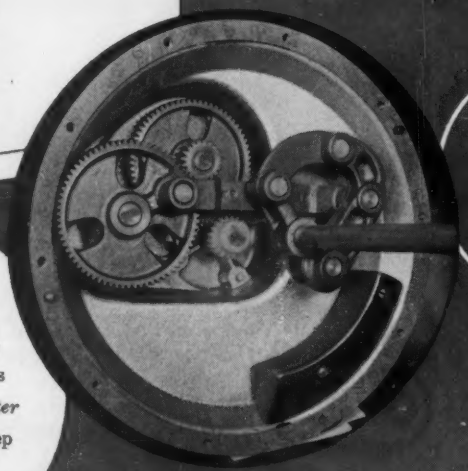
LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

437-C.

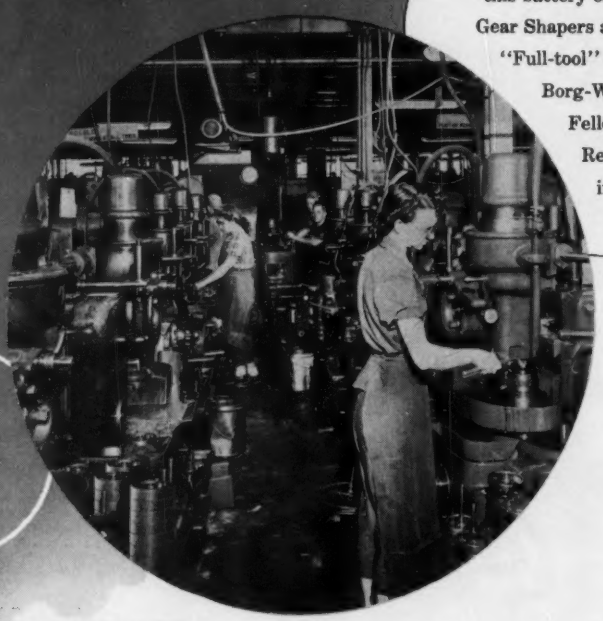


TO STIMULATE NORGE



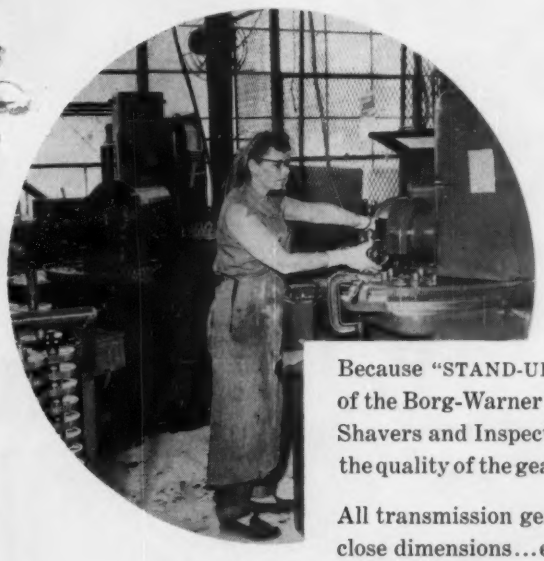
QUALITY of these transmission gears which drive the agitator keeps mechanical operation *quieter* longer... helps to keep housewives sold on Norge.

QUALITY gears in quantity are economically produced by this battery of Fellows 7-Type Gear Shapers and No. 8 "Full-tool" Gear Shavers. Borg-Warner uses Fellows No. 8M Red Liner for inspection.



THE PRECISION LINE

SALES . . . . . *Borg-Warner cuts, shaves and inspects ALL gears by the Fellows Method*



Because "STAND-UP" QUALITY builds reputation...Norge Division of the Borg-Warner Corporation selected Fellows Gear Shapers, Gear Shavers and Inspection Instruments to procure positive control over the quality of the gear trains in their "Time-Line" Automatic Washers.

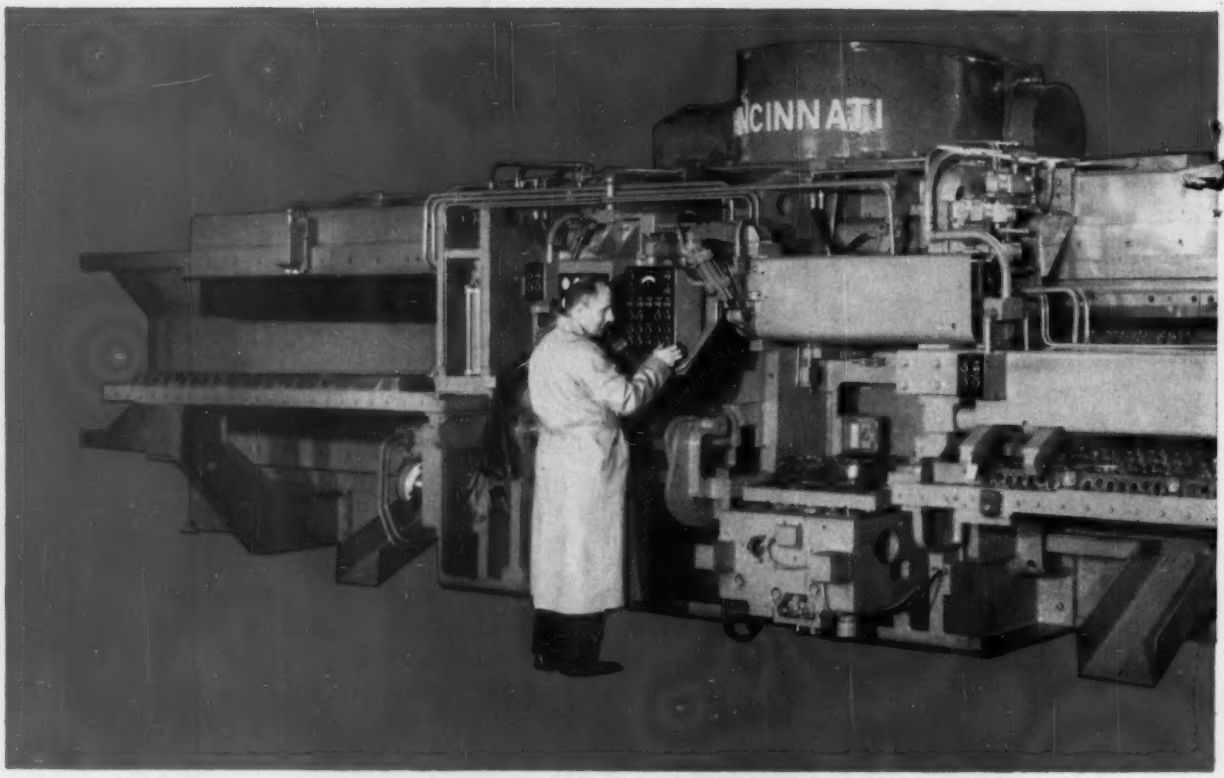
All transmission gears that drive the agitator are cut and shaved to close dimensions...even the small nylon pinion is cut by the Fellows Method. Result: Norge's mechanical operation is quiet when the machine is new and stays quiet...and the housewife gets many extra Mondays of service life.

When looking for a better way to produce *quality gears in quantity* ...why not follow the example set by so many of America's Leading Manufacturers? Talk over your gear production problems with a Fellows Representative.

THE FELLOWS GEAR SHAPER CO.
Head Office and Export Dept., 78 River St., Springfield, Vermont
Branch Offices: 319 Fisher Building, Detroit 2
5835 West North Avenue, Chicago 39
2206 Empire State Building, New York 1
6214 West Manchester Ave., Los Angeles 45

Fellows *Gear Production Equipment*

Look what happened



CINCINNATI 22-foot stroke, Two-Way Horizontal Broaching Machine, tooled up and conveyorized to broach cylinder heads.

PRODUCTION DATA

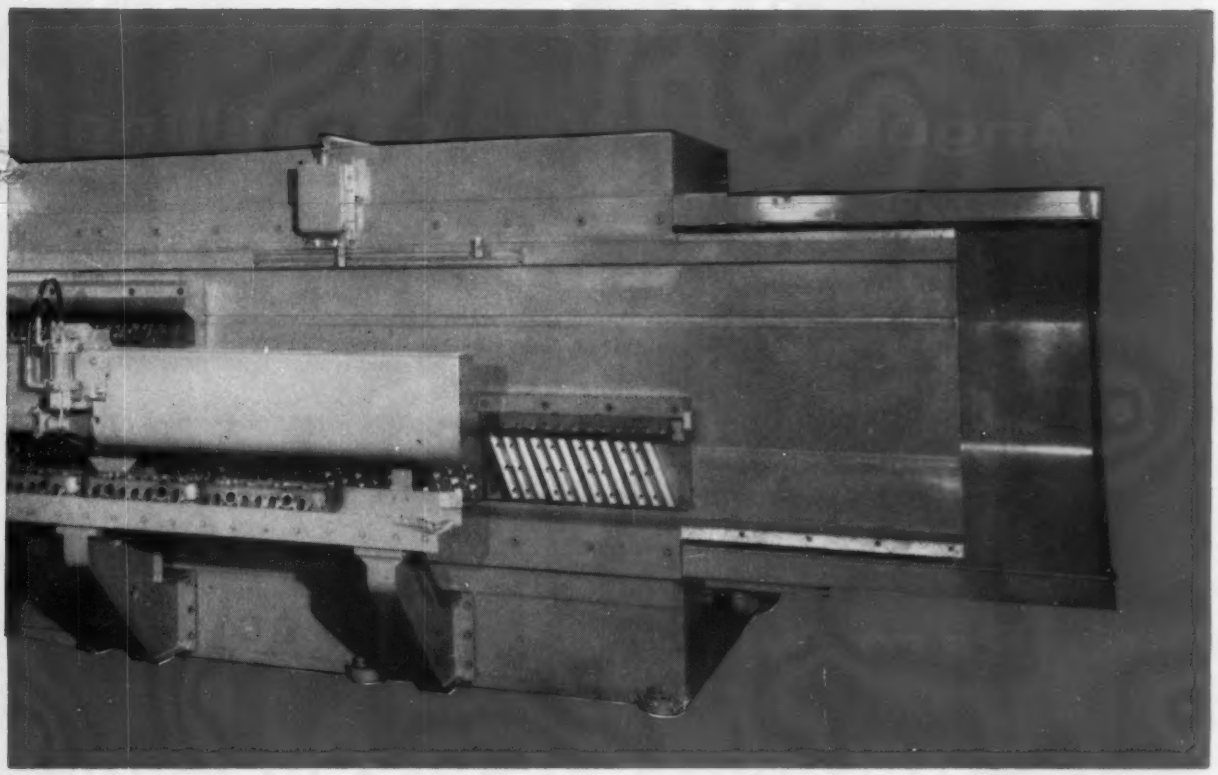
Surfaces broached	*top, joint, intake and exhaust faces*
Cutting speed	*150 feet per minute*
Stock removal	*3/16" (1/2 ton per hour)*
Production	*150 heads per hour*

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING

between Shows

CINCINNATI Horizontal Broaching Machine Multiplies Cylinder Head Production by 2 1/2



When the 1947 Machine Tool Show was in progress, cylinder blocks and heads were broached at a rate of production which seemed unbeatable. Broaching speed was about 37 feet per minute, and production about 55 parts per hour. Before the 1955 Show was even in the formative stage,

> Cincinnati Milling developed new Horizontal High Speed Surface Broaching Machines that are 2½ times faster than comparable equipment no older than Show '47, and tool life per unit has increased 25 times!

While these cost savings are more spectacular than might be realized in the production of smaller parts, they are indicative of the big strides made by Cincinnati Milling in reducing costs through the application of modern broaching techniques. Remember this: Cincinnati's broaching experience dates back more than 20 years . . . Cincinnati was first in developing many present-day broaching concepts such as electro-mechanical drive . . . Cincinnati builds a complete line of horizontal and vertical broaching machines, including large special broaches built to your specifications. Would you like to have a picture-book review and brief specifications of CINCINNATI Horizontal Broaching Machines? Write for catalog No. M-1910.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

If You Do Horizontal, Angular and Vertical Milling

Why Buy Two when ONE VAN NORMAN Ram Type Milling Machine will increase production, . . . cut costs!

Phone, wire or write for complete information about these cost cutting millers.

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export

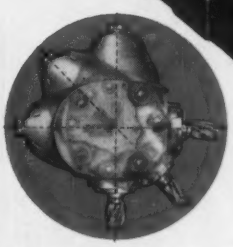
VAN NORMAN

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

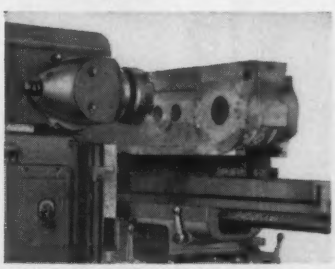
NO. 28...

one of 10 new Van Norman Ram Type Millers

TABLE SIZE: 58″ x 13″
CUTTERHEAD MOTOR: 7½ H.P.
RAM MOVEMENT: 29″
18 FEEDS; 12 SPEEDS

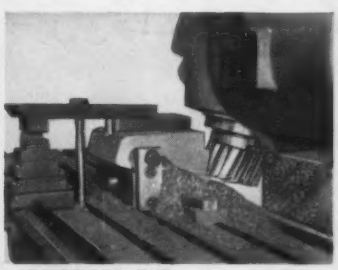


THE ADJUSTABLE CUTTERHEAD PERMITS HORIZONTAL, VERTICAL OR ANGULAR MILLING ON ONE VAN NORMAN MILLER.



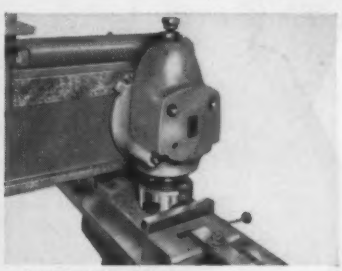
HORIZONTAL...

A heavy horizontal milling cut performed on a milling machine ram. The rigidity of machine prevents chatter. Material cast iron; Cutter 8″ Carbide Face Mill; Speed 189 rpm; Feed 15 ipm; Depth of cut 1/16″; Width up to 7″.



ANGULAR...

An angular milling operation is being performed on a workpiece. Angular range of cutterhead is 0 degrees to 90 degrees. Accurate positioning is simplified by easy-to-read graduations.



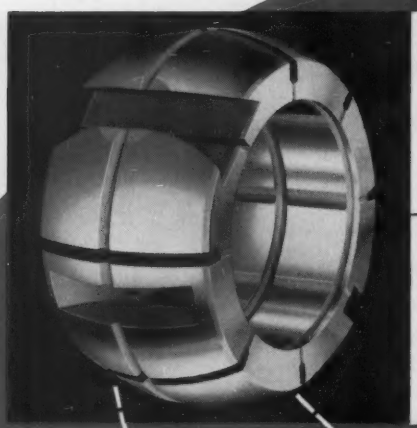
VERTICAL...

With Cutterhead in vertical position, cast iron saddle body is milled with a 6″ Carbide Face Mill. A heavy finish cut is made. Speed 267 rpm; Feed 14½ ipm; Depth of cut ¼″.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

Multi-wheel spindle



Rigidized Microsphere Bearings

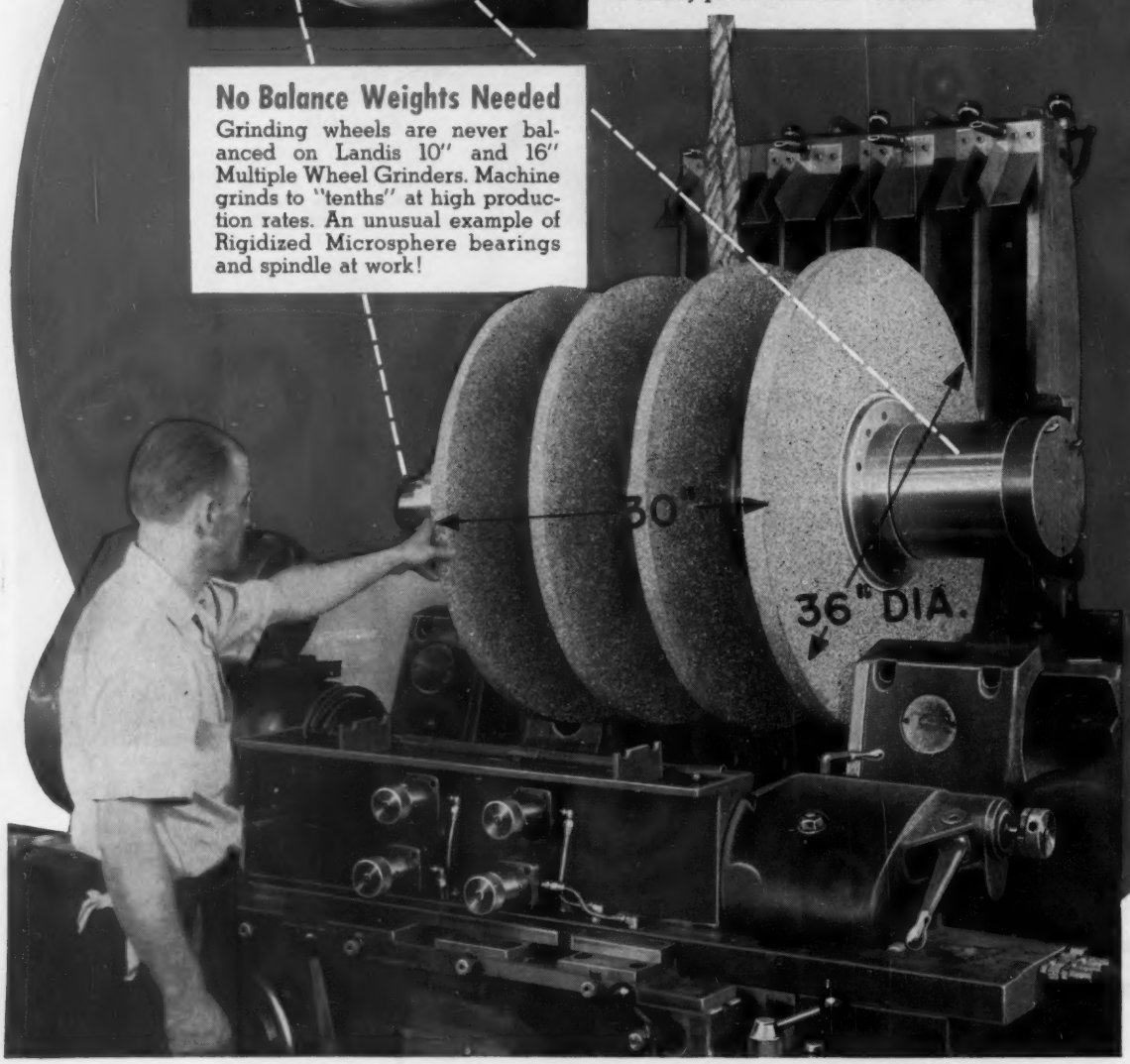
These one piece steel bearings are babbitt lined. The spherical shape permits perfect alignment of the spindle and bearing. Extremely close running clearance results in quick sparkout and accurate response to wheel feed.

Rigidized Wheel Spindle

Spindle diameter is increased between the Microsphere bearings on Landis grinders. This extra stiff spindle, coupled with the Microsphere bearings is the most rigid wheel unit available. Pays off in steady production and accurate work.

No Balance Weights Needed

Grinding wheels are never balanced on Landis 10" and 16" Multiple Wheel Grinders. Machine grinds to "tenths" at high production rates. An unusual example of Rigidized Microsphere bearings and spindle at work!



grinds to tenths

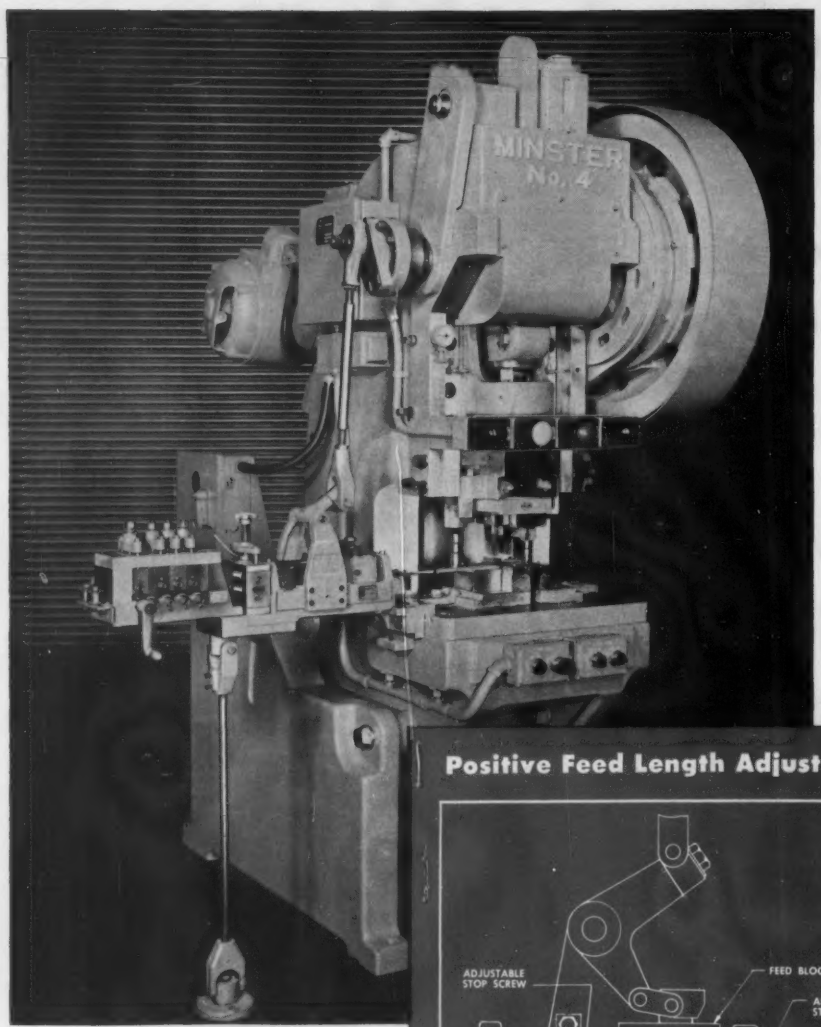
Rigidized Microsphere bearings and spindle solve unusual grinding problem

Grinds 5 diameters of 80 shafts per hour to .0005" tolerance. Stock removal is .015" from each diameter. Machine is Landis 10" x 30" Type H-IW Multiple Wheel Grinder.

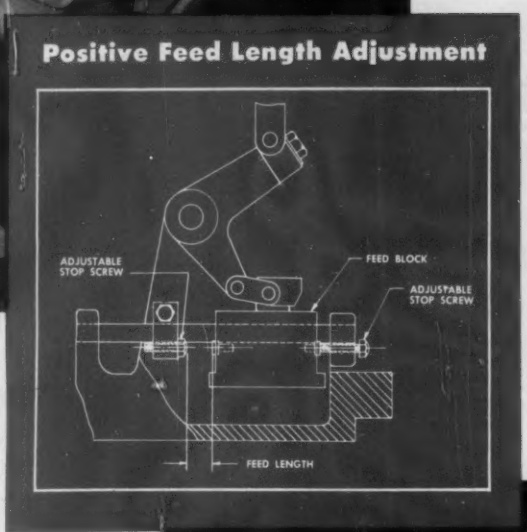
LANDIS TOOL COMPANY
WAYNESBORO, PENNA.

LANDIS

precision grinders

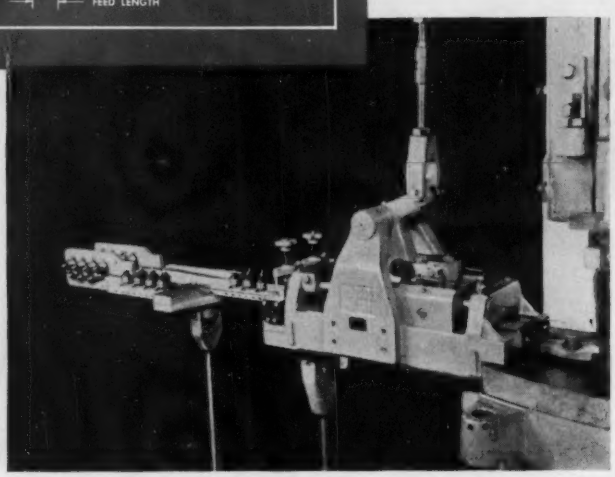


The photo at the left shows an SF-1 U. S. Slide Feed with SS-07 U. S. Plain Stock Straightener (7-roll type) mounted on a No. 4 Minster Press which is equipped with an air clutch and variable speed drive.



The drawing at the right shows how feed length is controlled between positive adjustable stops on the U. S. Slide Feed. This feature assures controlled accuracy of feed length—an especially important factor in progressive die operations.

The illustrations at the right show three other setups using U. S. Slide Feeds, U. S. Stock Reels, U. S. Coil Cradles, and other U. S. Automatic Press Room Equipment.



Make Your Press Room Operations
AUTOMATIC

Cost reduction is of the utmost importance to you. One means of achieving this is through automatic operation. U. S. Slide Feeds are designed and built primarily for the automatic feeding of coil stock into punch presses. By using U. S. Slide Feeds with U. S. Straighteners and Stock Reels you can convert your presses into automatic machines. The illustrations show a number of different types of setups using U. S. Stock Reels, Coil Cradles, Slide Feeds and other Press Room Equipment.

The use of this equipment gives you the double advantage of increased production and reduced labor costs, plus the feature of flexibility. Within their capacity, U. S. Slide Feeds can be easily adapted to handle materials varying in width, thickness and length of feed. Furthermore, U. S. Slide Feeds are designed so that the length of feed is controlled between positive stops, as shown in the drawing on the opposite page, providing consistent accuracy that is especially desirable in progressive die operations.

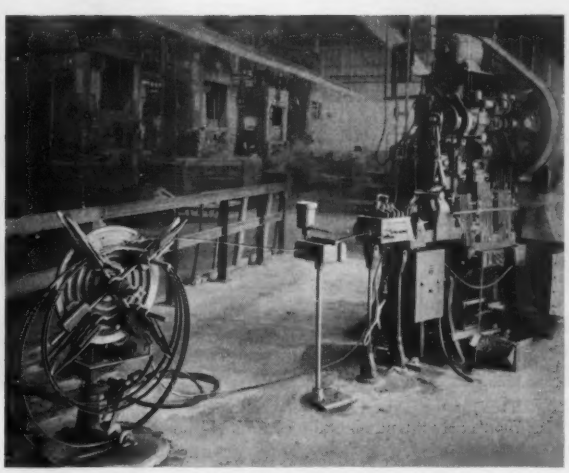
We are sure that you want to reduce costs and speed output in your press operations, and we suggest that you investigate the many advantages of U. S. Automatic Press Room Equipment. Bulletin 80-M gives complete specifications. Ask for your copy.

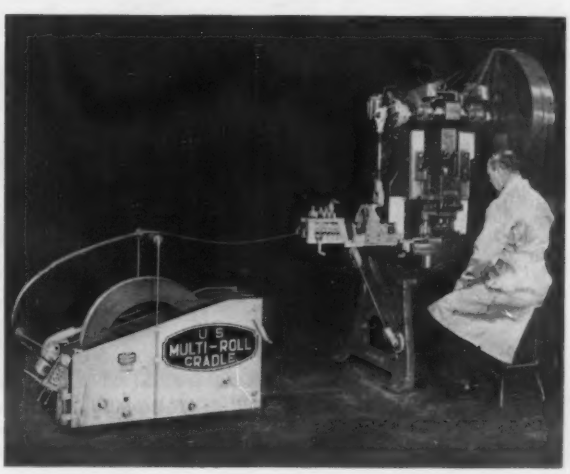
U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

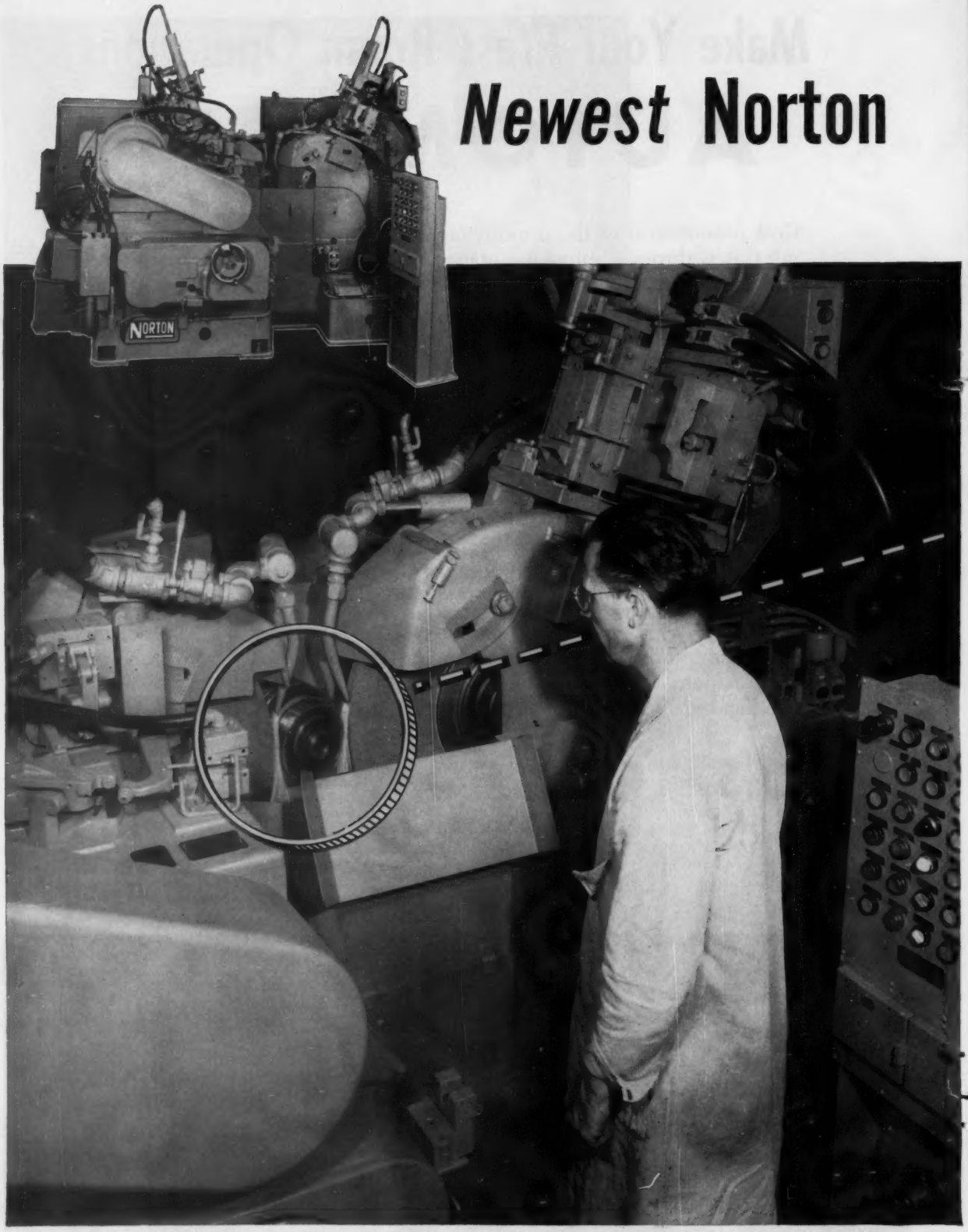
Builders of U. S. Multi-Slides — U. S. Multi-Millers

U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories



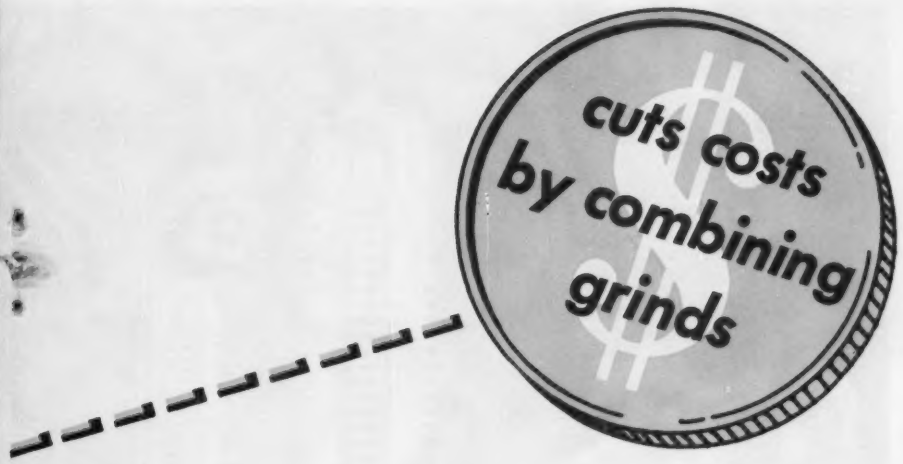


Newest Norton



The "Touch of Gold" In Multiple Diameter Grinding. This Norton Type CMS-1 Semiautomatic Multi-Wheelslide Cylindrical Grinder is set up to grind two conical surfaces simultaneously in automatically controlled plunge grinds. The wheelslides, opposed here, may be positioned in-line if the job requires.

grinder for multiple diameters



The Type CMS-1 Semiautomatic Multi-Wheelslide Grinder handles jobs impossible on ordinary multi-wheel machines

Here's a brand new Norton grinder with a special capacity for high production, low cost grinding of multiple diameter work.

The Type CMS-1 Semiautomatic Multi-Wheelslide Cylindrical Grinding Machine cuts production time and expense in a number of different ways. It grinds with top speed and accuracy. It reduces grinding wheel costs. Most importantly, it eliminates the need for separate grinds on separate machines.

Advanced Multi-Wheelslide Arrangement

During building, the Type CMS-1's sturdy, unitized wheelslides are positioned — opposed or in line — for specific job requirements. In use, slight angular or lateral adjustments may be made when setting-up. Each wheelslide mounts one or more 30″ grinding wheels, with the type of work-holding equipment depending on the job. Slides operate in unison during production, but may be individually controlled for set up.

Other Outstanding Features

- Central, one-lever control of the automatic grinding cycle — plus automatic, electrically timed termination of the cycle — for greatly simplified operation.
- Two-rate automatic feed assures ideal conditions for rapid stock removal, with highest accuracy and finish.
- Convenient wheel feed hand wheels have "click-count" indexing, permitting feed adjustments in increments of "tenths." This simplifies size control in setting-up and in initial operation.
- Individual push-button-operated jogging control of wheelslides aid production by simplifying size control.
- Automatic wheel guard type truing devices operate consistently at predetermined speed and feed. Control of the amount of abrasive removed is close and uniform, with compensation of wheelslide setting for wheel diameter reduction. Results are most efficient, effortless truing, with reduced wheel cost per piece ground.

Get All The Facts

on the new Type CMS-1 grinder from your Norton Representative. Learn how you can improve your competitive position by replacing two or more old grinders with this ultra-modern machine. Or write direct to us for the whole story. And remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

To Economize, Modernize With **NEW**

NORTON

GRINDERS and LAPPERS

Making better products... to make your products better

District Sales Offices: WORCESTER • HARTFORD • NEW YORK • CLEVELAND • CHICAGO • DETROIT

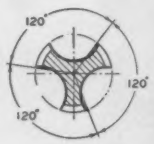
For more information on products advertised, use Inquiry Card, page 243

BALANCED *Action* PERFORMANCE

Taps with these four craftsmanship-qualities will deliver it—All Winter Taps Have It

EXACT FLUTE SPACING

is the first fundamental of Balanced Action. It is accomplished by precision indexing.



UNIFORMITY OF FLUTE CONTOURS

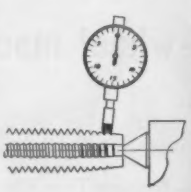
is essential, of course. You can't get Balanced Action without it.

PRECISION CHIP DRIVER CONTOURS

are exact to size, shape, and position—formed to give the finest performance.

ACCURATE AND CONCENTRIC CHAMFERS:

By holding shank, chamfer, and thread concentricity to very close limits, hole-accuracy is assured.



WINTER®

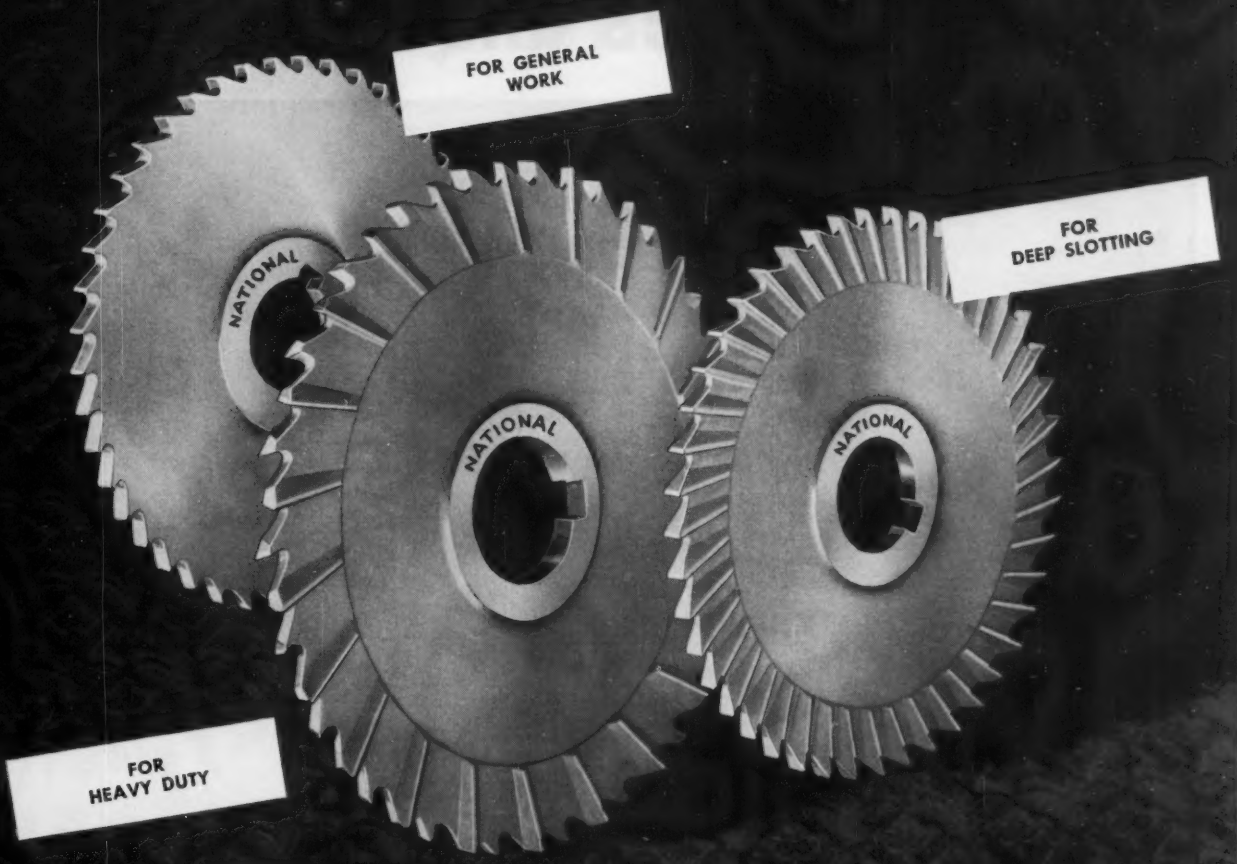
WINTER GAGES
plug and ring, thread and plain are made with "Balanced Action" accuracy

CALL YOUR WINTER DISTRIBUTOR

WINTER BROTHERS COMPANY, Rochester, Michigan, U.S.A.

Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago Dallas • San Francisco • Los Angeles • Division of National Twist Drill & Tool Co.

For more information on products advertised, use Inquiry Card, page 243



National

NATIONAL TWIST DRILL & TOOL CO. ROCHESTER, MICH. U.S.A. ®

The bite that's right for your sawing and slotting

Smooth. No binding, no scoring. Saws with National cutting edges do the job the way you want it done. Immediately available—a wide range of diameters and widths; also many special types of saws and slotting cutters.

CALL YOUR NATIONAL DISTRIBUTOR

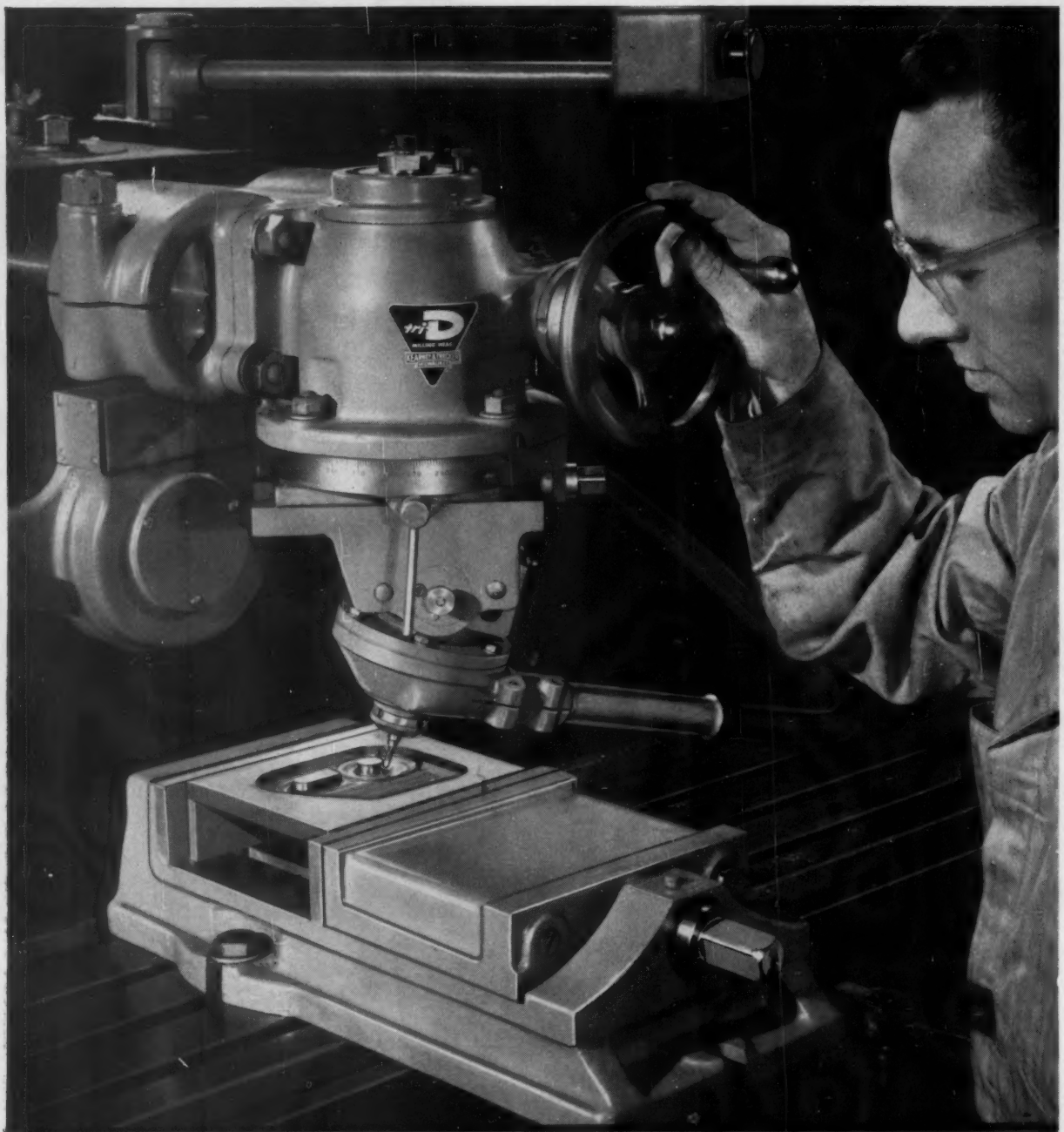
NATIONAL TWIST DRILL AND TOOL COMPANY

Rochester, Michigan, U.S.A. Distributors in principal cities. Branches in New York Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles

TWIST DRILLS • REAMERS • COUNTERBORES • MILLING CUTTERS • END MILLS • HOBS • CARBIDE TIPPED AND SPECIAL TOOLS

For more information on products advertised, use Inquiry Card, page 243

Mill circles and angles in



Angular adjustment of cutter in the vertical plane is an exclusive feature of the TRI-D Milling Head. Here, operator performs finish milling on intricate workpiece requiring straight, circular, angular and radii milling . . . all in a single set-up.

This job and many others are featured in a 20-minute sound color film, "The Little Showoff." Write on your company stationery for reservation.

Builders of Precision and Production Machine Tools Since 1898

For more information on products advertised, use Inquiry Card, page 243

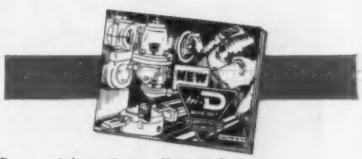
one set-up with

Pat. No. 2286821
Other Pat. Pend.

For tool rooms, die shops or production milling—do it faster, easier with new TRI-D Head

Kearney & Trecker's new TRI-D Milling Head — featuring rotary movement, lateral and angular adjustment in vertical plane — measurably cuts production milling costs . . . eliminates multiple set-ups . . . produces more in less time. As illustrated, the TRI-D attachment is ideally suited for rough and finish milling of various geometric shapes—straight lines, radii, circles, angles — all in a single set-up. What's more, it's adaptable for quick and easy mounting on almost all horizontal and some vertical milling machines . . . *regardless of make.*

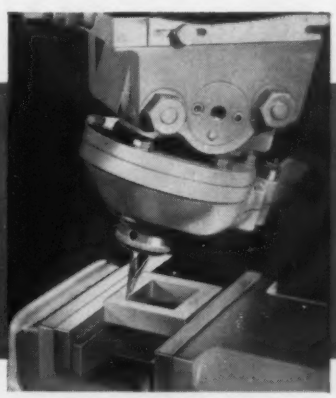
Learn what TRI-D can do for you—how different it is from all other types of milling heads. Your Kearney & Trecker representative will be glad to arrange a "proof-positive" demonstration without any obligation. Contact him today, or write Kearney & Trecker Corporation, 6784 W. National Avenue, Milwaukee 14, Wisconsin.



For more information on Kearney & Trecker's new TRI-D Milling Head, write for catalog No. TD-10.

Die (left) and punch (right) are rough and finish milled in a single set-up, using all three basic movements of the TRI-D and universal milling machine. Table is swiveled for milling straight side of both workpieces. Table movement is

used to mill the long straight side. TRI-D is rotated. Saddle feed is engaged to mill short straight side. At tangent of next radii, saddle feed is disengaged and entire procedure repeated. Clearance angle in die is milled using same dimensions.

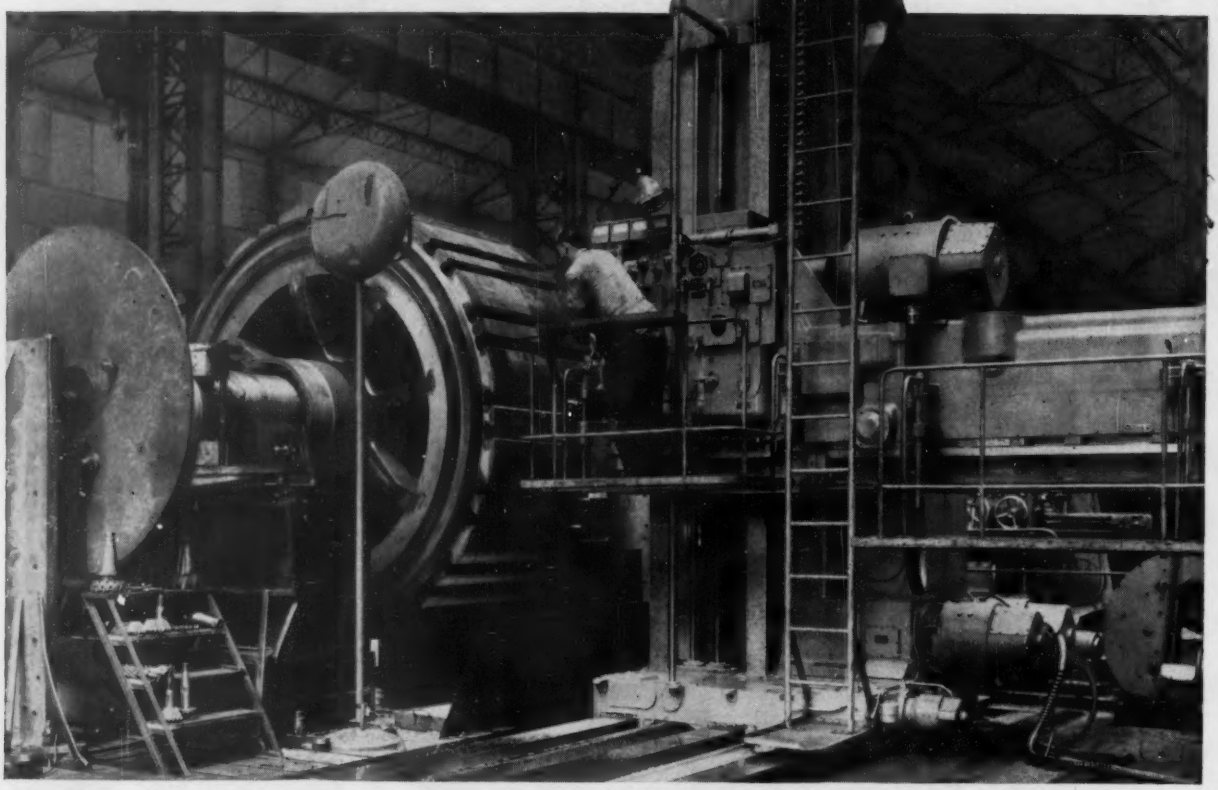


TRI-D Head, with an ordinary end-mill ground to a specific angle, is used to finish a "square corner." Adjustment of TRI-D Head and swivel block to prescribed setting and vertical feed of the milling machine is required to do the job.

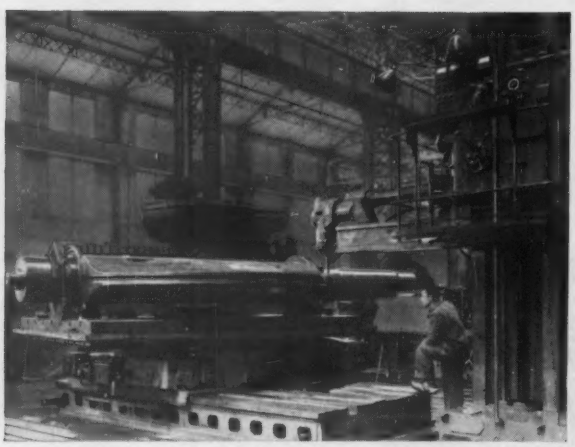
Kearney & Trecker
CORPORATION
MILWAUKEE 14, WISCONSIN

UNSURPASSED ADAPTABILITY

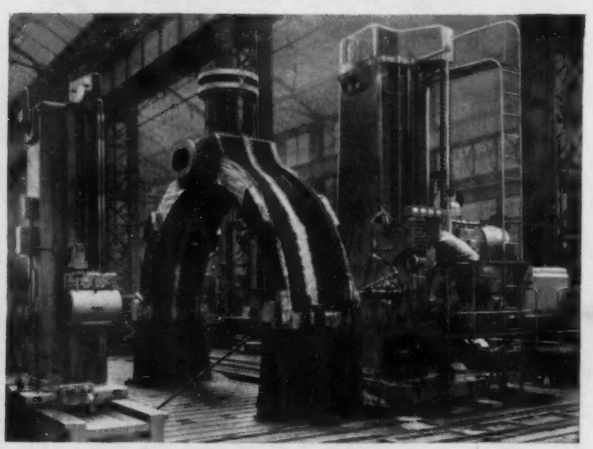
• Profiling rotor spider's rim for 32,000 kw generator, driven by propeller type hydraulic turbine, done on G&L 570-F, Horizontal Boring, Drilling and Milling machine. Rotor weighs 75 metric tons.



Societe Des Forges & Atelier du Creusot (Usines Schneider), France.



• Angular milling attachment, mounted on heavy-duty underarm, permits milling and grooving circular surfaces of steel turbine wicket gate. Rotary table, with ample power for feeds and rapid traverse, assures smooth, accurate milling of workpiece.



• Employing main spindle feed and vertical movement of headstock, operator performs angular and vertical milling of pads on weldment. All operations are controlled from platform or portable control station.

to machine difficult-to-reach surfaces

Societe Des Forges & Atelier du Creusot uses Giddings & Lewis Model 570-F Horizontal Boring, Drilling and Milling Machines with underarm support . . . attachments and accessories. Result — greatly extended scope of operations on huge workpieces.

Hydraulic turbine-generator units, swing jaw and gyratory crusher components and other large castings are only a few of the giants machined to exact tolerances on Giddings & Lewis Model 570-F (floor-type) Horizontal Boring, Drilling and Milling machines. Because these machines are able to perform a wide variety of operations in a single setup, they're always in great demand at Societe Des Forges & Atelier du Creusot (Usines Schneider), France.

The 50 Series machines, illustrated here, are equipped with 7″ dia. main and 2.5″ dia. auxiliary spindles, each covering a different range of speeds and feeds. Continuous feed facing and boring head permits even greater flexibility of operation involving machining of difficult-to-reach surfaces. Angular milling attachment, mounted on heavy-duty underarm support, allows milling, facing and boring operations at right angles to spindle as far as 60″ from the headstock. What's more, use of a power-driven revolving table eliminates numerous extra set-ups of workpiece.

If you'd like to know how to reduce set-up time, speed-up production when machining huge workpieces, contact your Giddings & Lewis representative or write to factory.

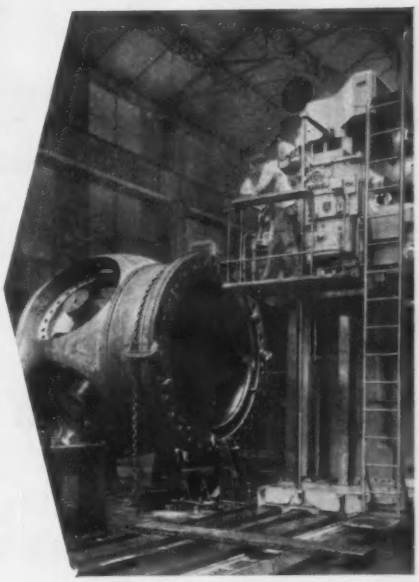
Literature Available:

Ask for Catalog No. 50-F with details on 50 Series Horizontal Boring, Drilling and Milling machines.

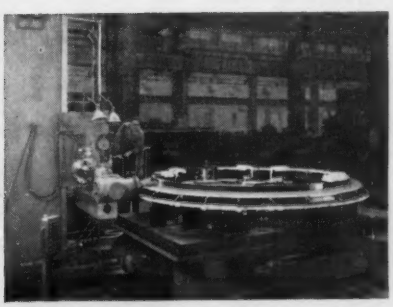
GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

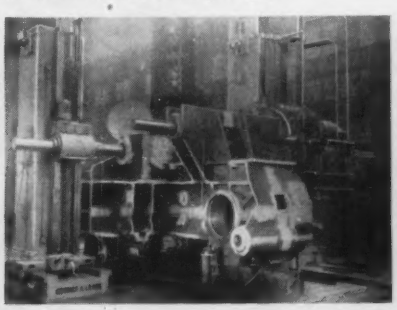
Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open-side Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.



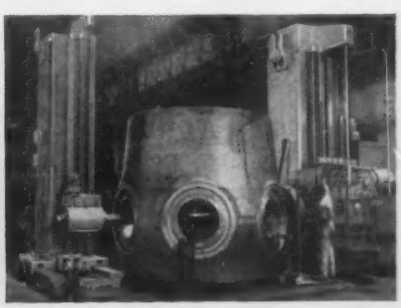
• Drilling, boring, reaming, tapping, back facing and countersinking a series of 100mm diameter holes in upper flange of hub for mounting adjustable turbine runner blades accomplished on G&L Model 570-F Horizontal Boring, Drilling and Milling machine.



• 90° angular milling attachment on underarm permits precise circular milling. Race width, 250mm; cutting depth, 4mm; circular feed, 20mm per min.



• Bearing and shaft bores of 27 (metric) ton jaw crusher frame are precision-machined on G&L Model 570-F machine. Long boring bars, heavy cutting tools are held in perfect alignment with G&L end-support.



• Steel hub (for Kaplan adjustable blade hydraulic turbine-generator unit) is line bored on G&L Model 570-F machine. Boring bar is mounted on continuous feed facing head which handles all boring operations.

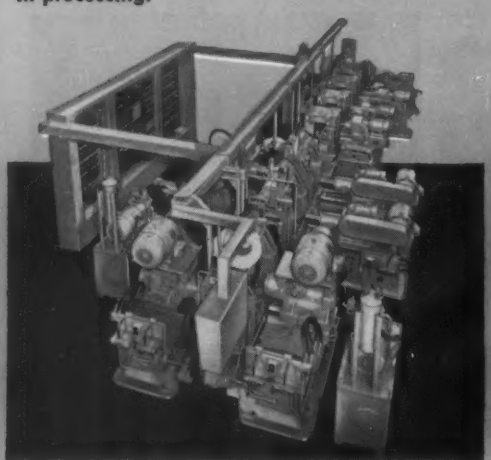
SNYDER SEGMENTED AUTOMATION in 91 station, 182 operation, in-line transfer machine features four segments which can operate independently or as a unit to assure continuous production of automotive automatic transmission cases at 100 cases an hour at 80% efficiency

SNYDER

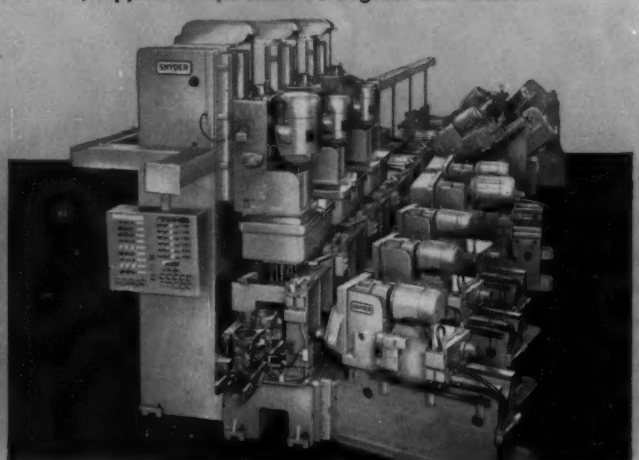
TOOL & ENGINEERING COMPANY
3400 E. LAFAYETTE, DETROIT 7, MICHIGAN

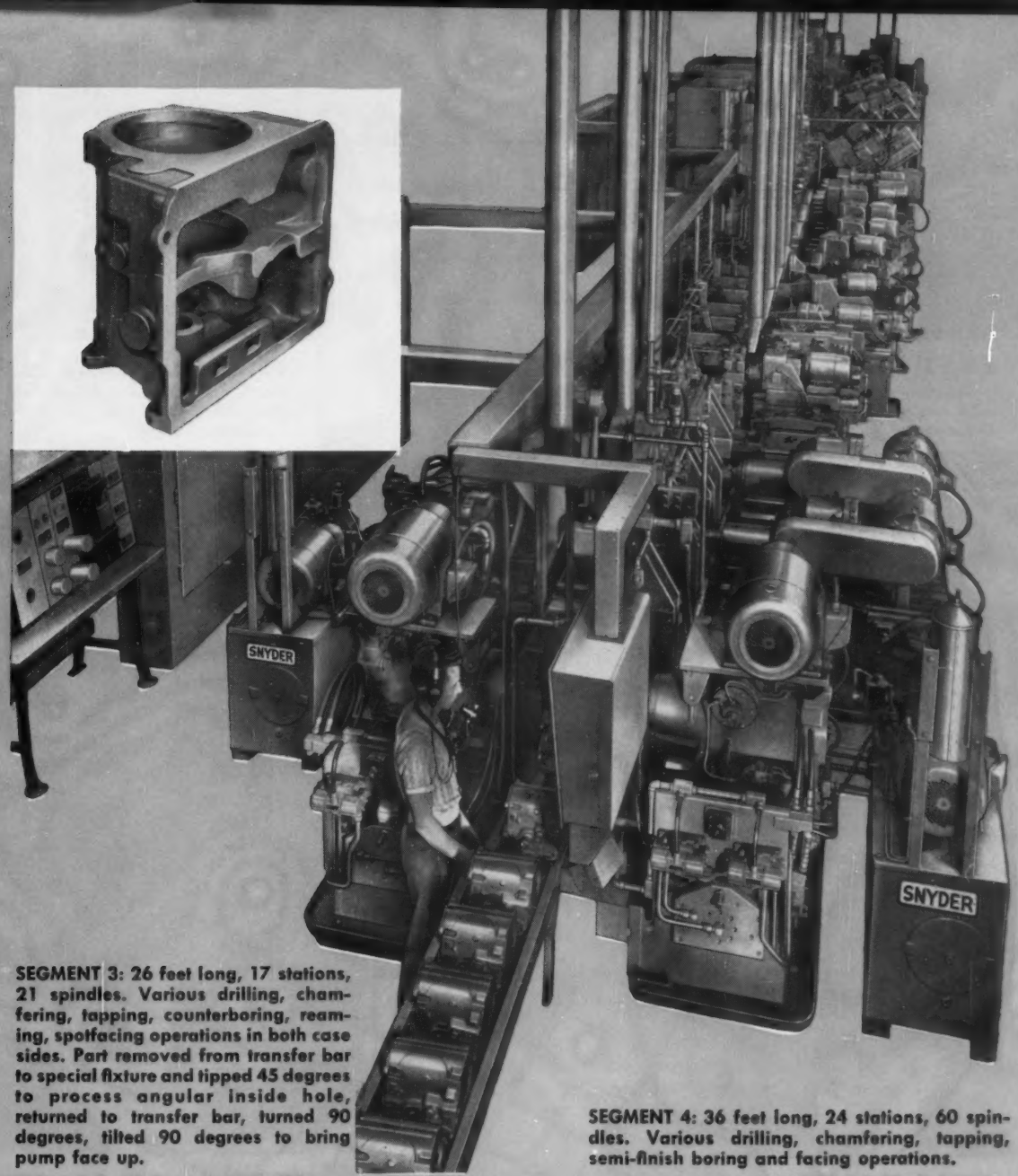
30 Years of Successful Cooperation with Leading American Industries

SEGMENT 1: 40 feet long, 19 stations, 10 spindles. Part manually loaded, both ends face milled, counterbored, three diameters rough and finish bored and faced, two pads side milled, pump pad face milled, clearance slot milled. Part tilted 90 degrees in processing.



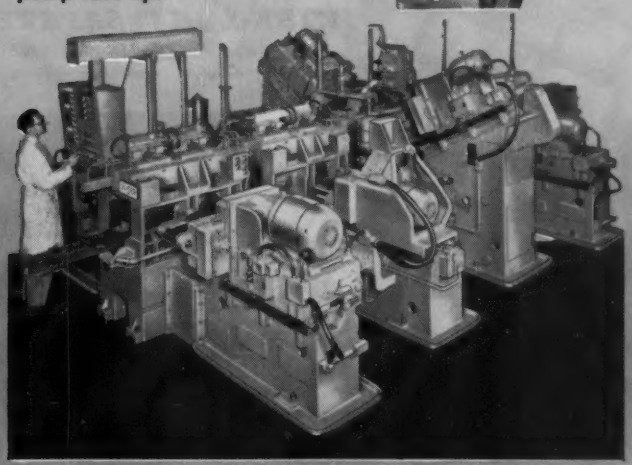
SEGMENT 2: 47 feet long, 31 stations, 91 spindles. In top face, end and at angular locations inside, 51 holes are drilled, countersunk, semi-finish and finish reamed, spotfaced, tapped. Part is tilted 90 degrees and rotated.

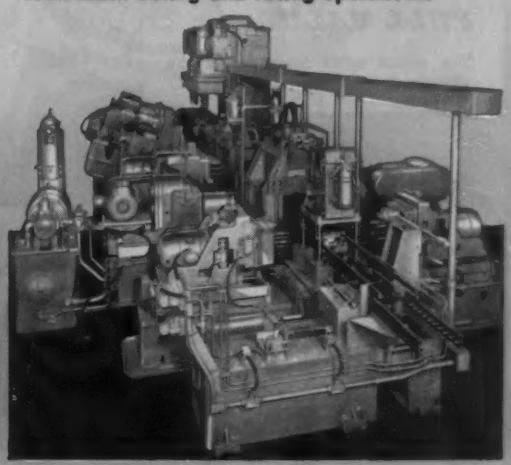




SEGMENT 3: 26 feet long, 17 stations, 21 spindles. Various drilling, chamfering, tapping, counterboring, reaming, spotfacing operations in both case sides. Part removed from transfer bar to special fixture and tipped 45 degrees to process angular inside hole, returned to transfer bar, turned 90 degrees, tilted 90 degrees to bring pump face up.

SEGMENT 4: 36 feet long, 24 stations, 60 spindles. Various drilling, chamfering, tapping, semi-finish boring and facing operations.





GARDNER WIRE-LOKT® CONSTRUCTION

Assures Maximum Safety . . . Low Operating Costs

FAST CUTS
Corrugations speed the grinding of large area work or thin parts without burning.

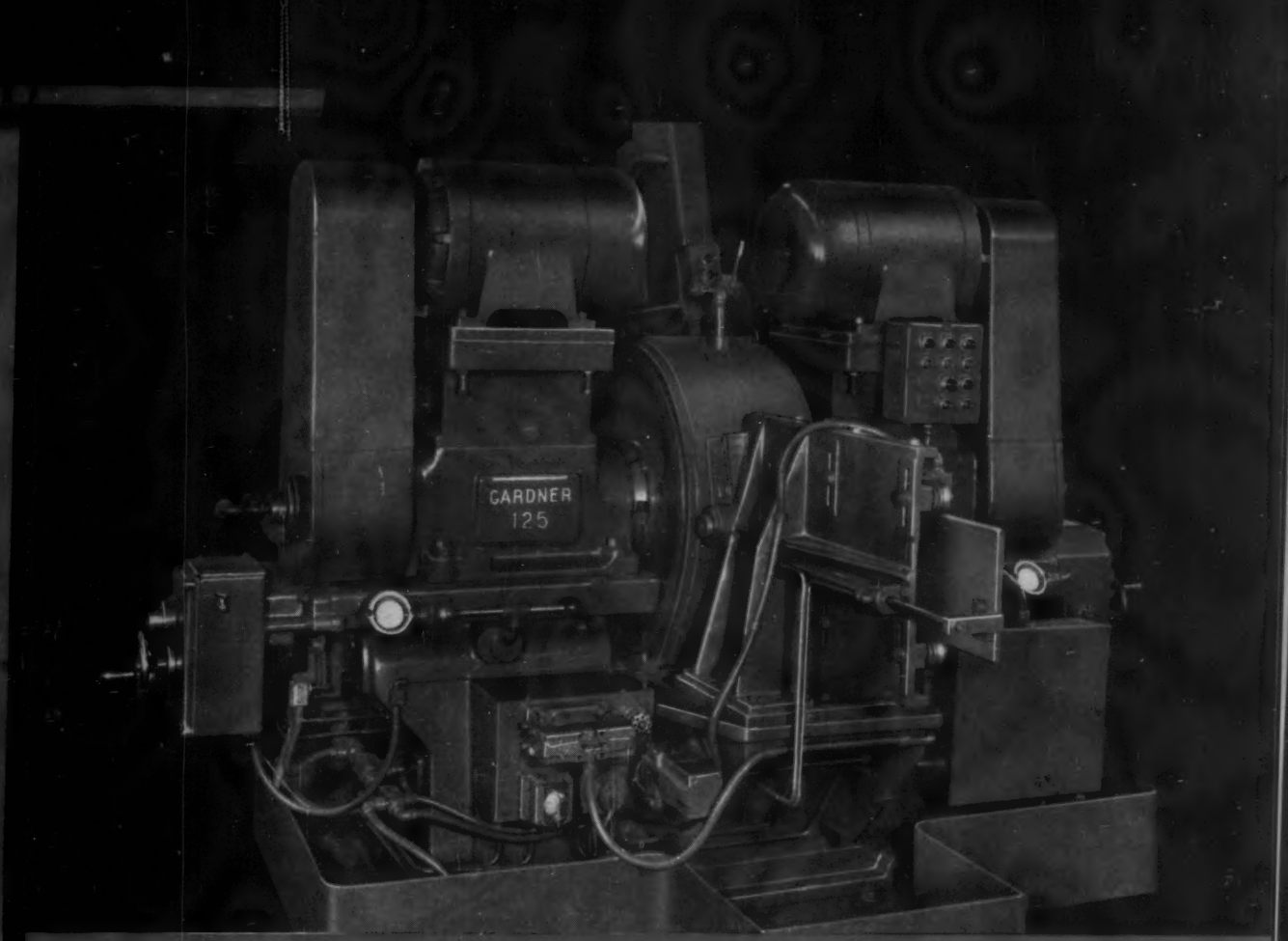
FINE FINISHES
For light stock removal smooth face discs give quality finishes and close tolerances.

FULL VALUE
The entire rated thickness of the abrasive is usable.

WIRE-LOKT® SAFETY
Heavy steel mesh securely imbedded in the abrasive assures maximum safety.

Gardner Abrasive Specialists give you the advantages of long experience gained from making *both* grinding machine and abrasive discs. Individual specifications will be developed to handle *your* particular grinding job.

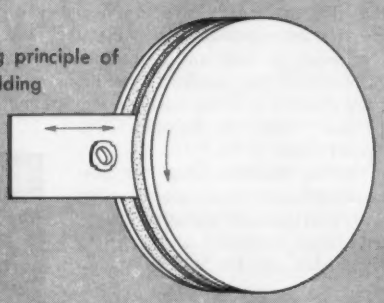
GARDNER
abrasive discs
BELOIT, WISCONSIN



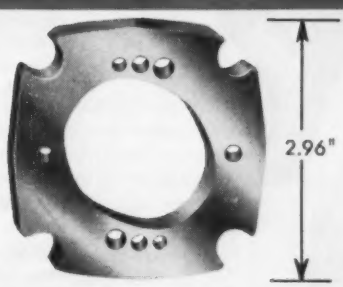
Disc grinds 200 pieces per hour to .0002" for flatness

Parallelism - - - .0002" Uniformity- - - .0003"

Gardner floating principle of work holding



Grinds **TWO** parallel surfaces in **ONE** operation



Steel pump ring

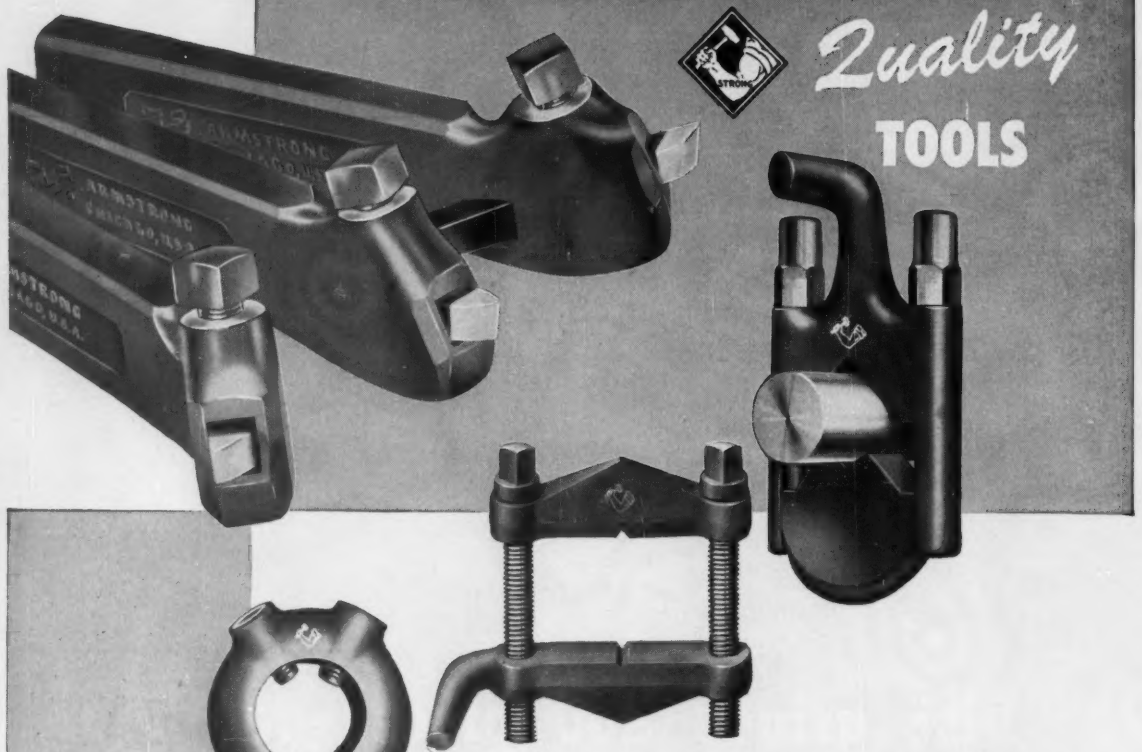
GARDNER

precision disc grinders

BELOIT, WISCONSIN

ARMSTRONG

Quality TOOLS



NOT A COST, BUT AN INVESTMENT

That Pays Year After Year . . .

Buy ARMSTRONG TOOL HOLDERS and TOOLS for today's jobs and they will bring you added profits thru the years. With ARMSTRONG TOOL HOLDERS you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter bits ground to many shapes. Each is an efficient tool, refined thru a half century of world wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.

ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG Lathe and Milling Machine Dogs are permanent tools too. They are drop-forged from special open hearth steel, are heat treated to extreme stiffness and toughness. They have alloy steel screws hardened at the tip to prevent up-setting and have double life, for hubs are made oversize to permit re-tapping.

ARMSTRONG Quality pays back over and over again. *Write for new S-48 catalog.* It offers many opportunities to conserve profits.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5213 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.

For more information on products advertised, use Inquiry Card, page 243

WHY GROWL . . .

. . . OVER YOUR GRINDING WHEEL PROBLEMS? You'll solve them easily when you switch to CINCINNATI (PD) GRINDING WHEELS. Because *now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—the most talked about development in years. Positive Duplication is a remarkable achievement in precision manufacturing and quality control that can *save you money . . . and increase your production.*

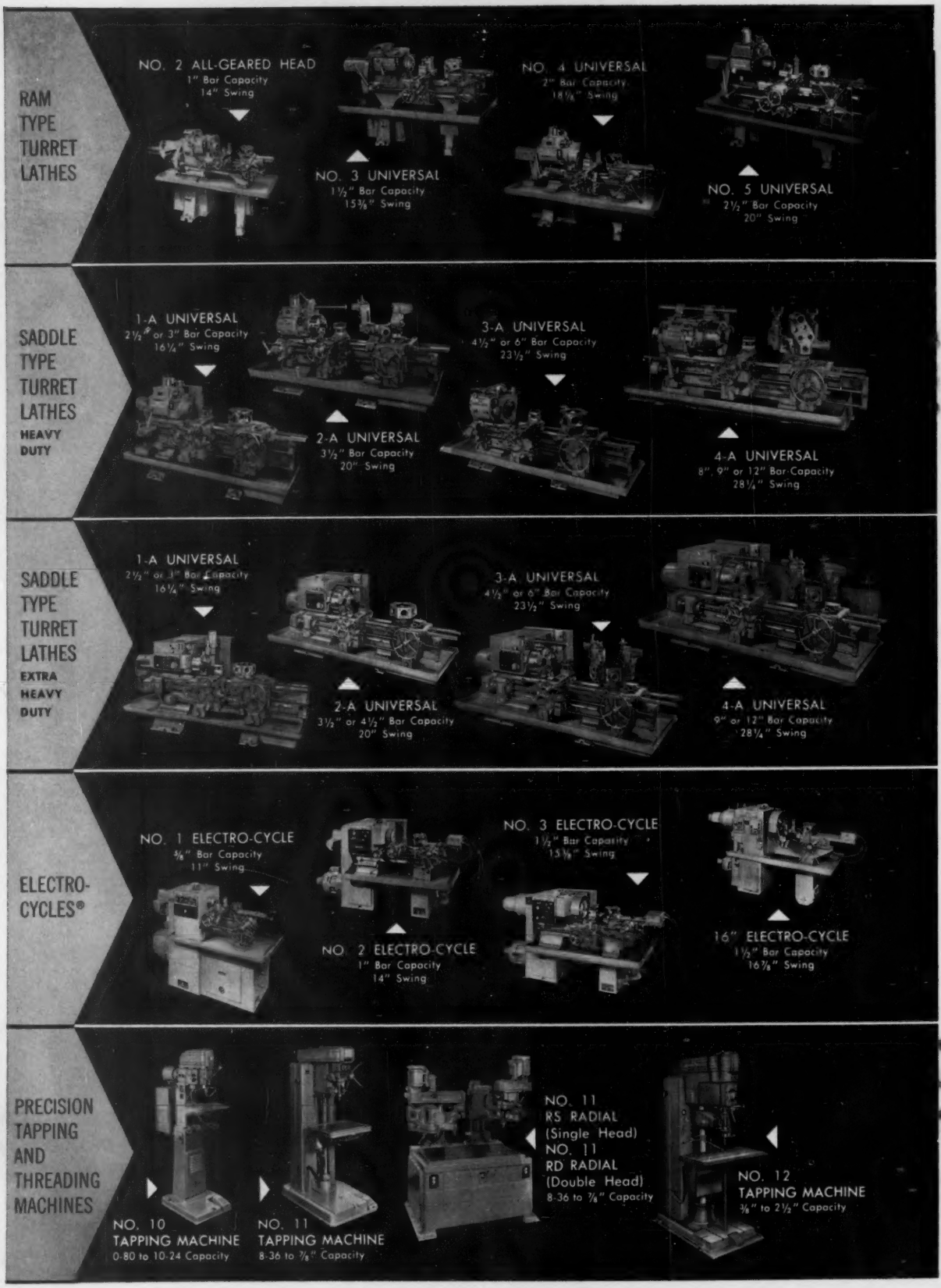
Through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS are priced no higher than ordinary wheels.

Let us sink our teeth into your grinding wheel problems, and we'll have you purring like a kitten. Contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

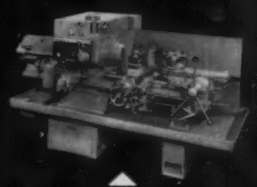
Remember . . . *only* CINCINNATI Grinding Wheels give you . . . (PD) POSITIVE DUPLICATION.

CINCINNATI
Grinding Wheels
A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

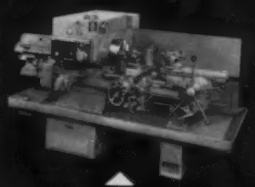

RAM TYPE TURRET LATHES
NO. 2 ALL-GEARED HEAD
1" Bar Capacity
14" Swing
NO. 3 UNIVERSAL
1½" Bar Capacity
15⅜" Swing
NO. 4 UNIVERSAL
2" Bar Capacity
18⅛" Swing
NO. 5 UNIVERSAL
2½" Bar Capacity
20" Swing
SADDLE TYPE TURRET LATHES
HEAVY DUTY
1-A UNIVERSAL
2½" or 3" Bar Capacity
16¼" Swing
2-A UNIVERSAL
3½" Bar Capacity
20" Swing
3-A UNIVERSAL
4½" or 6" Bar Capacity
23½" Swing
4-A UNIVERSAL
8", 9" or 12" Bar Capacity
28¼" Swing
SADDLE TYPE TURRET LATHES
EXTRA HEAVY DUTY
1-A UNIVERSAL
2½" or 3" Bar Capacity
16¼" Swing
2-A UNIVERSAL
3½" or 4½" Bar Capacity
20" Swing
3-A UNIVERSAL
4½" or 6" Bar Capacity
23½" Swing
4-A UNIVERSAL
9" or 12" Bar Capacity
28¼" Swing
ELECTRO-CYCLES®
NO. 1 ELECTRO-CYCLE
⅝" Bar Capacity
11" Swing
NO. 2 ELECTRO-CYCLE
1" Bar Capacity
14" Swing
NO. 3 ELECTRO-CYCLE
1½" Bar Capacity
15⅜" Swing
16" ELECTRO-CYCLE
1½" Bar Capacity
16⅞" Swing
PRECISION TAPPING AND THREADING MACHINES
NO. 10 TAPPING MACHINE
0-80 to 10-24 Capacity
NO. 11 TAPPING MACHINE
8-36 to ⅞" Capacity
NO. 11 RS RADIAL (Single Head)
NO. 11 RD RADIAL (Double Head)
8-36 to ⅞" Capacity
NO. 12 TAPPING MACHINE
⅜" to 2½" Capacity

No. 4 (M-2240) AND No. 5 (M-2250) RAM TYPE TURRET LATHES

ALL-CLUTCH AUTOMATIC SHIFTING HEAD



NO. 4 (M-2240)
2" Bar Capacity
18⅛" Swing



NO. 5 (M-2250)
2½" Bar Capacity
20" Swing

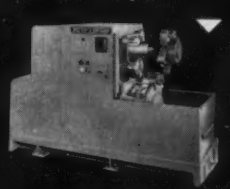
THERE is a proper size and type Warner & Swasey machine to fill your turning needs, for it has always been a cornerstone of Warner & Swasey policy to build an individual model for each type of work.

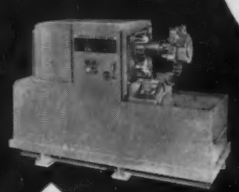
YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

75TH ANNIVERSARY YEAR
WARNER & SWASEY
Cleveland
PRECISION MACHINERY
1880 — 1955

SINGLE SPINDLE AUTOMATICS

1 AC CHUCKING MACHINE
8" or 10" Chuck —
6" Working Stroke





2 AC CHUCKING MACHINE
10" or 12" Chuck —
9" Working Stroke

MULTI-SPINDLE AUTOMATICS

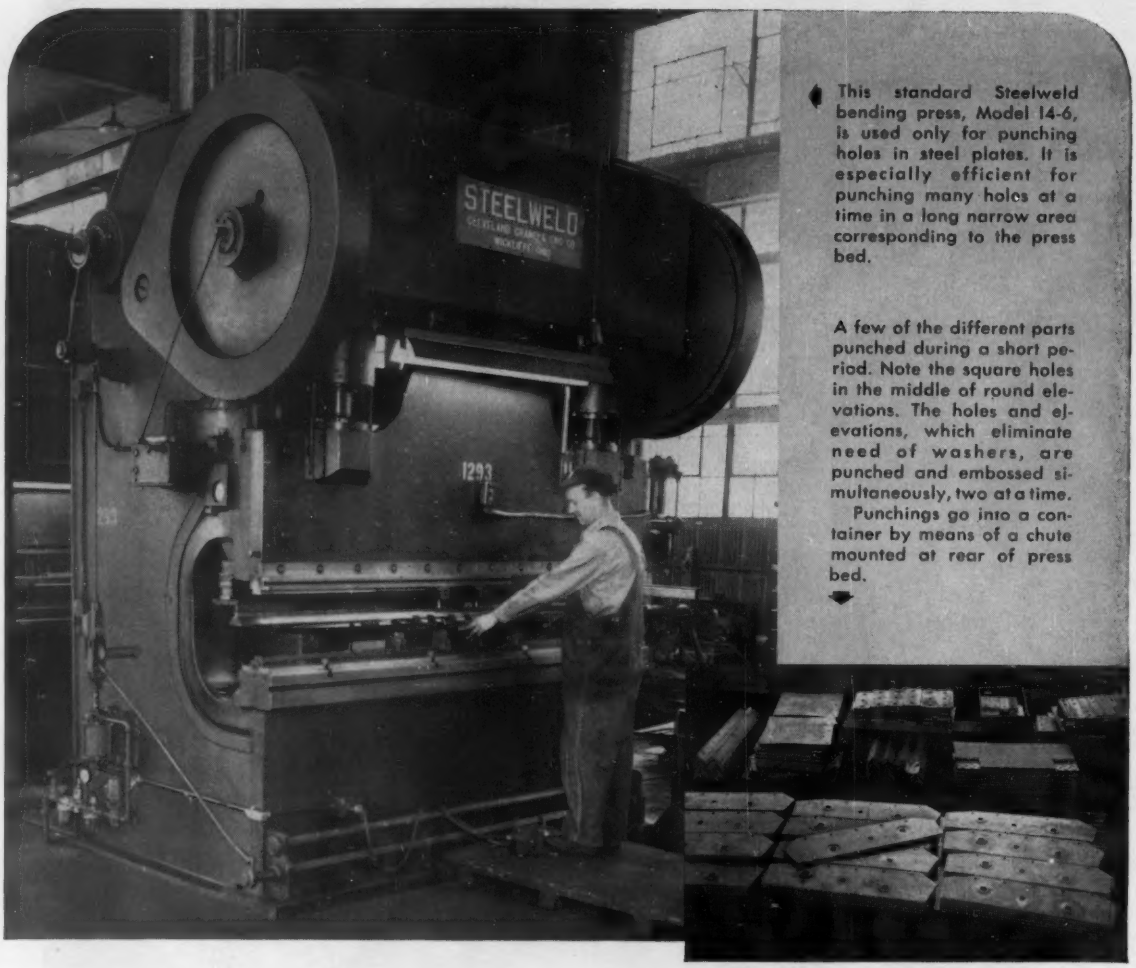
5-SPINDLE BAR MACHINE
1¾" Standard Bar Capacity
2¼" Oversize Capacity

5-SPINDLE CHUCKING MACHINE
6" Swing

6-SPINDLE BAR MACHINE
⅜" or 1¼" Bar Capacity

®Reg. U. S. Pat. Off.

Press Brake Used Solely For Multiple Punching



This standard Steelweld bending press, Model 14-6, is used only for punching holes in steel plates. It is especially efficient for punching many holes at a time in a long narrow area corresponding to the press bed.

A few of the different parts punched during a short period. Note the square holes in the middle of round elevations. The holes and elevations, which eliminate need of washers, are punched and embossed simultaneously, two at a time.

Punchings go into a container by means of a chute mounted at rear of press bed.

BENDING BRAKES are not always used for bending. Here is one that is used solely for multiple-punching work. It is on its 12th year of continuous operation, punching holes of various sizes and numbers.

While other Steelweld presses in the plant where this machine is located handle many bending and forming operations, any Steelweld can be quickly switched from one form of work to another and thus take care of a wide variety of jobs: bending, forming, multiple-punching, blanking, etc.

Steelweld Bending Presses are versatile, heavily-built tools designed for quick set-up, easy operation and long trouble-free performance. Hundreds of these machines are serving every segment of the metal-working industry. If you need a press brake, you will be happy with a tried and proven Steelweld.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

5460 E. 281 St. *Wickliffe, Ohio*

STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

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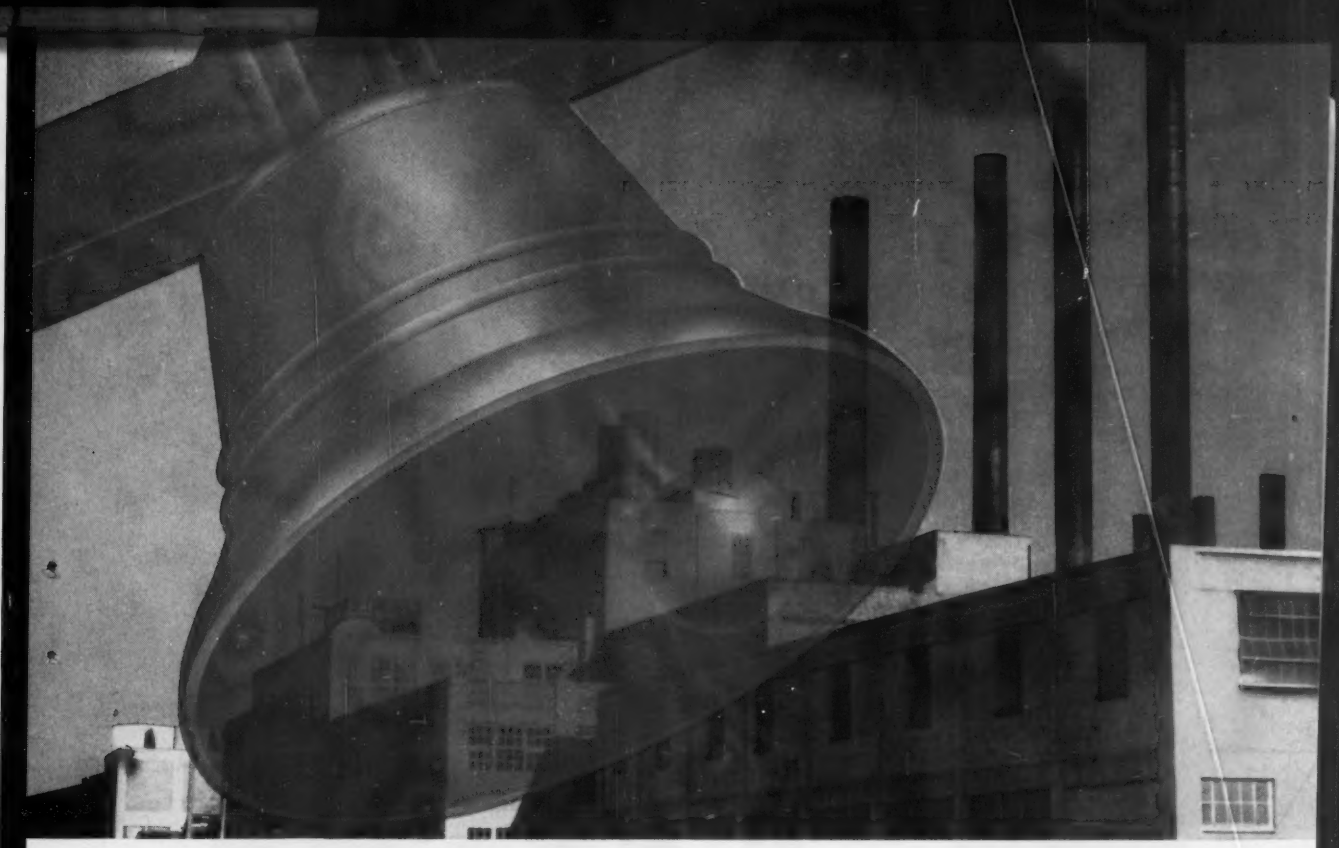


How to make your plant sound as a bell...

...SWITCH TO CIMCOOL®, the radically new and different cutting fluid that has become, in just a few years, the largest selling chemical cutting fluid in the world.

As the good news about CIMCOOL Concentrate rings out across the land, sales are continuing to climb. Here are just two of the many outstanding advantages that CIMCOOL has over old-fashioned cutting fluids:

- **CIMCOOL LOWERS COSTS** because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.
- **CIMCOOL DOES A BETTER JOB** because of its chemical lubricity. It permits faster speeds and increases tool life, for it combines friction reduction and cooling capacity in a degree never before attained.

We know CIMCOOL will ring the bell in your plant, and we'll be happy to tell you why—with an explanation of the many specific advantages of CIMCOOL Concentrate. We will also provide details on the entire family of CIMCOOL Cutting Fluids. Just contact us and we'll send one of our Cincinnati Milling-trained machinists—without cost or obligation. Wire, write, or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

CIMCOOL Concentrate—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL Tapping Compound—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT Base Additive — For jobs requiring an oil-base cutting fluid. Added to mineral oils, it gives an economical mix for higher speeds and feeds.

CIMCOOL Bactericide — The most effective agent yet developed to overcome rancidity.

CIMCOOL Machine Cleaner — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

Efficiency in Cutting-off is Important

Practically all machining operations start with pieces cut-off from bars or billets. Hence, inefficiency, or lack of capacity, in the cut-off department can hold up or stagnate the entire plant.

THE MARVEL NO. 6A AND 9A HEAVY DUTY HACK SAWING MACHINES

A. Are all-ball-bearing and provide a quick return; therefore they run FASTER than others on the same work.

B. Can apply as much as 1200 pounds feed pressure—two to ten times as much as other hack saws and band saws.

C. Are fully automatic, requiring no more operator attention than an automatic screw machine; and set-up for any bar size and cut-off length is extremely simple.

D. Use a non-breakable high speed hack saw blade—the type of saw blade that produces the greatest number of square inches of metal cut per dollar of blade cost—two to ten times (or more) as much as any band saw.

E. Because of their exceptional sturdiness, ball bearing reciprocating frame, ability to tension the blade "truly taut", their accuracy is dependable.

If you are not using modern, improved MARVEL NO. 6A and 9A production hack saws, call the local MARVEL Field Engineer and get his production and cost estimates on your work—to compare with your experience records.

Formula for Accuracy in Metal Sawing:
ACCURACY = Length, Straightness, Squareness
Straightness / Squareness = Blade Rigidity / Blade Tautness
MARVEL
HIGH-SPEED EDGE
ARMSTRONG BLUM MFG. CO.
CHICAGO ZZ MADE IN U.S.A.

The composite MARVEL High-Speed-Edge Hack Saw Blade—cuts **any** machinable material efficiently. There is no time lost changing blades for different types of steel; no time lost replacing shattered blades, because MARVEL High-Speed-Edge Hack Saw Blades are positively **unbreakable.** These superior blades have the finest high speed steel cutting edge welded to a strong alloy steel body. They will stand-up under the highest speeds and heaviest feeds attainable on any make hack saw. Can be safely tensioned tauter than any other blade—cut-off not only straight but also square and with less stock loss.

Write for catalog C-55—showing and describing eleven different series of Metal-Cutting Sawing Machines and MARVEL-High-Speed-Edge Hack Saw Blades and Hole Saws.

MARVEL Metal Cutting SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

For more information on products advertised, use Inquiry Card, page 243

CINCINNATI

1205 REVIEW

. . . highlighting **CINCINNATI MILLING'S**

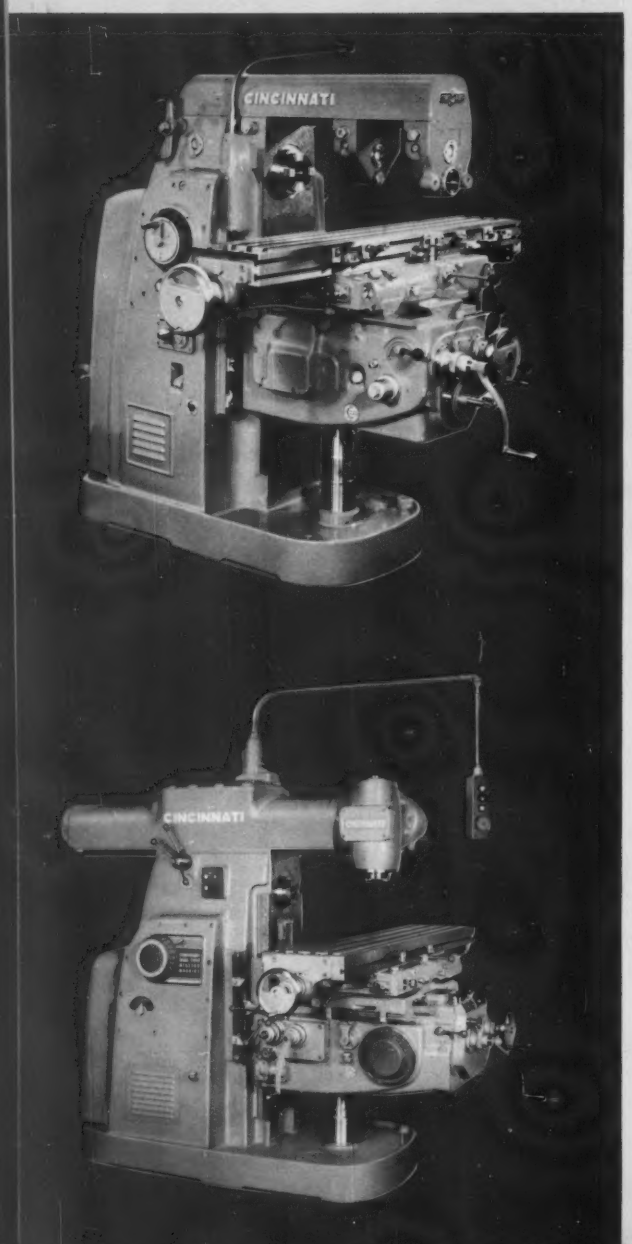
exhibit at the

Machine Tool Show

THE CINCINNATI MILLING MACHINE CO. CINCINNATI 9, OHIO

CINCINNATI

According to the publisher of a widely distributed metalworking magazine, over 45% of their readers did not plan to attend the recent Machine Tool Show. Were you one of the "stay-on-the-job" group? If you were, we're sure that you're just as interested in what's new as those who attended the Show. And we want you to see some of the fine machine tools that were operating and demonstrated in Cincinnati Milling's display Area 1205. Open this advertisement its full length . . . there you see today's finest milling machines and complementary equipment. Then turn the page over its full length and you will see the newest in precision grinding machines, designed to improve quality and reduce costs. And be sure to take advantage of the literature offer mentioned in the closing statement, rear of this advertisement.

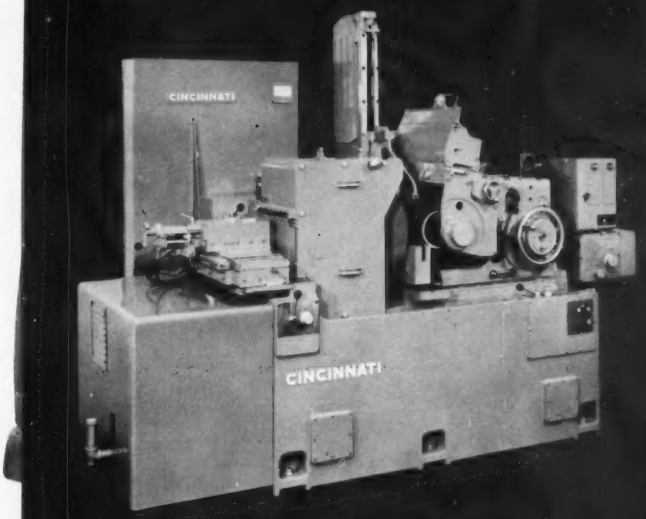


New CINCINNATI Nos. 2ML and 2MI Milling Machines

New features which will reduce costs in your shop include auxiliary motor for feed drive (full hp of main drive motor transmitted to the spindle); cutting fluid pump now individually motor driven; filters relocated for easier accessibility. Automatic Table Cycles, available for Plain and Vertical Machines, include Automatic Backlash Eliminator. Automatic Spindle Stop available for Automatic Cycle Machines. The illustration shows a No. 2MI Plain, with Automatic Table Cycles. Publication No. M-1916.

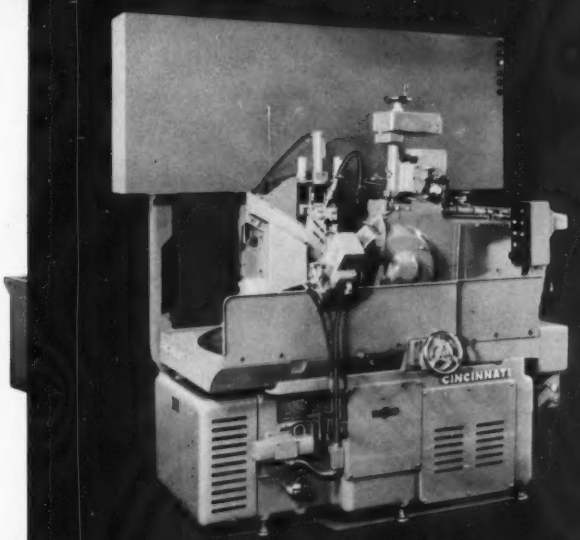
New CINCINNATI Dial Type Milling Machines

are heavier and more powerful than ever before, yet they retain the famous Dial Type characteristics of accurate performance and convenient, easy operation. All sizes (Nos. 2, 3, 4) are available in Plain, Universal and Vertical styles. All are equipped with Automatic Backlash Eliminator; motor driven cutting fluid pump; feed drive motor mounted on the knee; push-button spindle speed change and spindle start-stop. New Independent Overhead Spindle Attachment (illustrated) available for Plain and Universal Machines. Plain and Vertical Machines are available with or without Automatic Table Feed Cycles. Catalog No. M-1915.



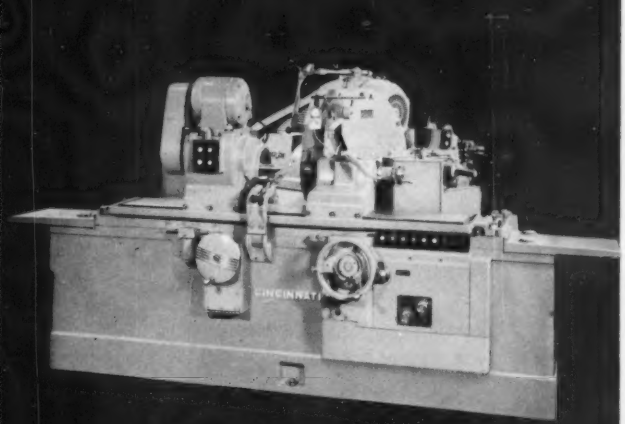
New CINCINNATI FILMATIC No. 3 Centerless Grinding Machines

are completely new from the floor up. Cost-reducing features include anti-friction lower slide; infinitely variable regulating wheel drive; power profile grinding wheel truing; stabilized infeed screw. Extra equipment includes automatic grinding wheel balancing and bar grinding attachments for work up to 24 feet long. Many other attachments are available, including Automatic Infeed, Feedmatic Hoppers, various types of Workrests, etc. Write for catalog No. G-664.



New CINCINNATI FILMATIC Micro-Centric Grinding Machines

like their predecessors, perform the miracle of combining high production with working gage accuracy. New Micro-Centric features include magnetic drive plate which greatly reduces loading time; front handwheel control with fine and coarse adjustment positions; machine mounted cabinet for complete and accessible electrical controls. Ask for catalog No. G-662.

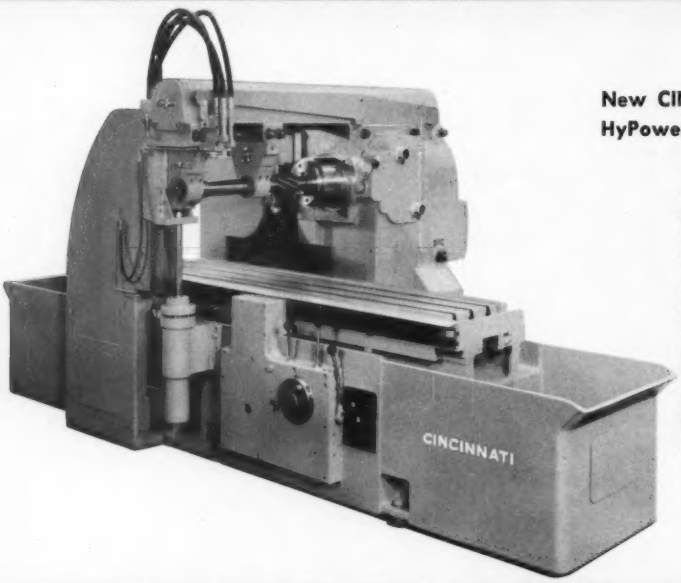


New CINCINNATI FILMATIC Semi-Automatic Angular Wheel Slide Grinding Machines

drastically reduce the cost of precision cylindrical work requiring accurately ground diameters and adjacent shoulders. Both are completed in one automatic infeed cycle. These machines, built in 6"R, 10"L, 10"R and 14"L swing sizes, are equipped with Automatic Grinding Wheel Balancing. Get your copy of catalog No. G-647.

New CINCINATI High Power and Dual Power Dial Type Milling Machines

are unquestionably the heavyweight champions among knee-type milling machines. Now, the full power of the main drive motor (up to 50 hp) is transmitted to the spindle; a 5 hp motor takes care of feed and rapid traverse requirements. One lever selects 24 spindle speeds and 32 feeds; one lever engages table feed and rapid traverse; a small lever on the knee engages the spindle clutch. The power and agility of this heavyweight champion is truly controlled with your fingertips. Built in Nos. 3, 4, 5 and 6 sizes. More information in catalog No. M-1917.



New CINCINNATI Tracer Controlled HyPowermatic Milling Machines

are built in Plain and Duplex styles and 42 sizes of each from 36" to 168" table traverse; up to 50 hp spindle drive and separate 5 hp feed drive. They combine heavy duty tracer controlled milling with all the conventional milling operations assignable to Plain and Duplex HyPowermatics. Simple sheet metal template are attached to the fixture or table. Profiles having curvatures and straight lines at angles up to 80° from the horizontal can be accurately milled. Want complete specs? Ask for catalog No. M-1909.

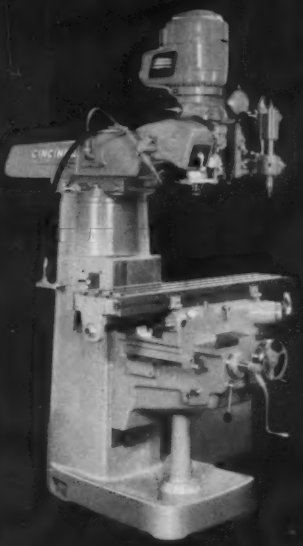
New CINCINNATI FILMATIC No. 2 Cutter and Tool Grinder

Good News — FILMATIC has been added to the name of another Cincinnati machine tool . . . CINCINNATI FILMATIC No. 2 Cutter and Tool Grinder. These famous machines are now equipped with a lifetime spindle unit incorporating FILMATIC bearings. You'll like these features, too . . . the main drive motor is more powerful (1 hp) and built into the wheelhead; the slenderized column requires less floor space; ways for anti-friction slide are hardened and ground. Complete data in catalog No. M-1914.

THE CINCINNATI MILLING MACHINE CO.

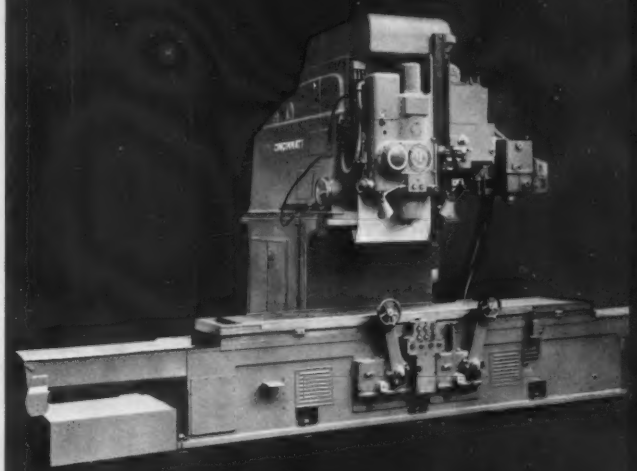
New CINCINNATI Contourmaster Tool and Die Milling Machines

have all the features and characteristics so desirable for low-cost die sinking operations. The table is manually controlled. For die sinking, vertical movements of the cutter head are automatically controlled through the Automatic Hydraulic Depth Unit and manually controlled for boring and drilling through slow feed handwheel or rapid action lever. Table traverse, 16" or 22"; cross traverse, 10"; spindle drive, 1 hp Catalog No. M-1919.



New CINCINNATI 30" Vertical Hydro-Tel Milling Machine,

a new member of the Hydro-Tel line, is flexible and easy to manipulate. It was developed for shops requiring large, rangy vertical millers having 20 hp spindle drive. Can be equipped for die sinking and/or profile milling. Operating controls are located at the front of the machine. Available in three bed lengths to provide table travel of 60", 96" or 120". More information available.



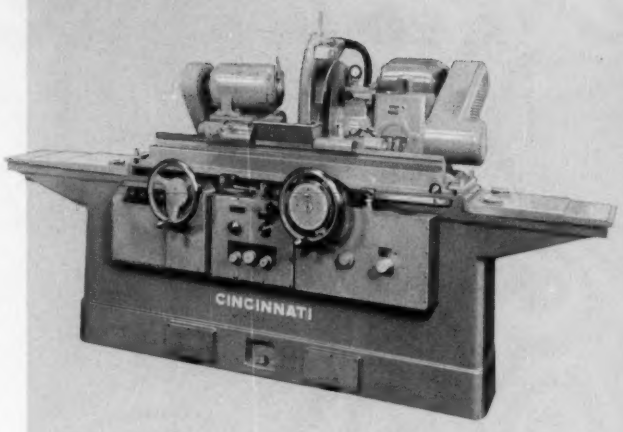
New CINCINNATI 12" Hydroform Machines

are greatly improved in appearance; they're more compact and require less floor space. Operating mechanisms within the machine have been redesigned to reduce maintenance expense. These machines and others of the five sizes available, are making enviable records in improving quality and reducing the cost of intricately formed parts. More details in catalog No. M-1908.

CINCINNATI 9, OHIO

New CINCINNATI FILMATIC Plain Hydraulic Grinding Machines

are more convenient to operate and more accurate in performance than ever before. In addition, Automatic Grinding Wheel Balancing, a feature that will pay off handsomely in your shop, is included with standard equipment. The following types of production equipment are available: Push-button Automatic Infeed Attachment; Automatic Gap Eliminator; Behind-the-wheel Profile Truing; Automatic Electric Gage Sizing with Automatic Compensation. Get the complete story in the following catalogs . . . 6"R and 10"L machines, G-660; 10"R and 14"L machines, G-661.



New CINCINNATI FILMATIC 12", 14" and 18" Hydraulic Universal Grinding Machines

New features of productivity and accuracy are incorporated in the new CINCINNATI FILMATIC 12", 14" and 18" Hydraulic Universal Grinding Machines. Pick feed rates are infinitely variable, and may be engaged at the right, left, or both ends of the stroke; the footstock spindle is now chromium plated to prevent wear; headstock speeds are selected with an easy-to-turn dial; rapid cross traverse feature available. Want more information? Ask for catalog No. G-663.

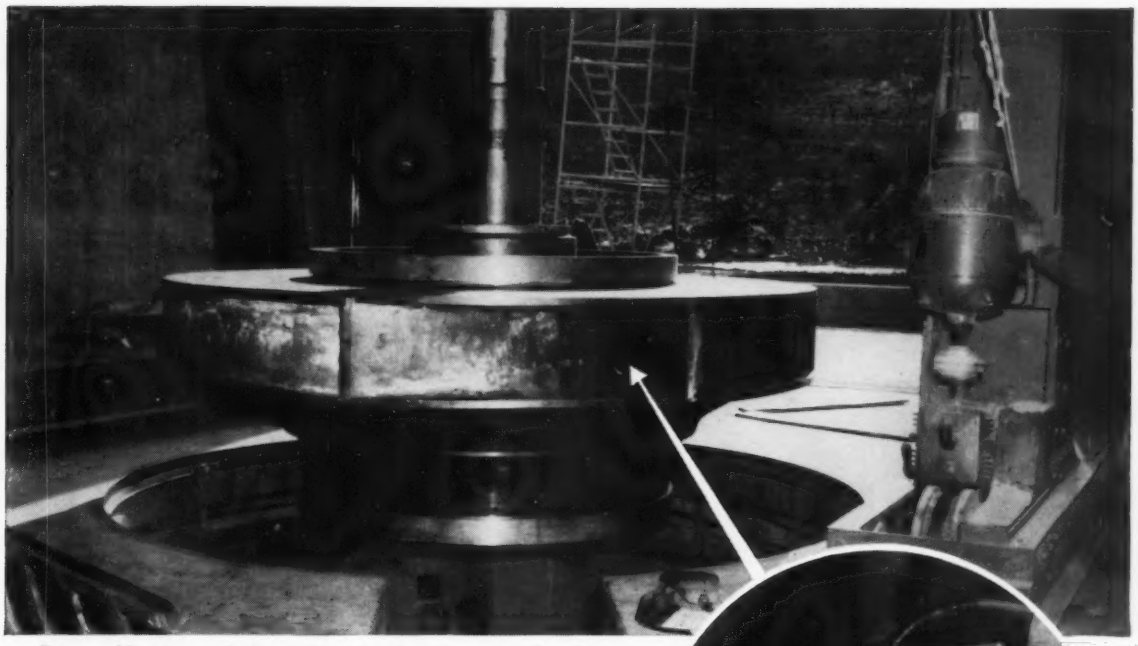
FILMATIC

CINCINNATI

It was a great show . . . the greatest ever. And Cincinnati Milling did their level best to demonstrate new machines and methods that constitute the world's best investment for shops of all sizes. We would much prefer to have talked to you personally, and to have given you more information and ideas that would be of more direct benefit. But for those who could not attend the Show, we'll have to settle for this brief review of 13 of the 43 machines in Cincinnati Milling's display Area 1205. We will be glad to forward literature on any of the equipment illustrated in this advertisement. Just give us the catalog numbers of the machines in which you are interested.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI



Sigma welding has made the repair of these large pump impellers faster and more economical. Finished welds are a sound, homogeneous bond.

Sigma Welding Saves $5,000 per unit

Speeds repair of world's second largest pumps . . .

During operation, giant 20 ton manganese bronze pump impellers like this one, suffer cracks ranging in size from small sand inclusions, to cuts over a foot long. By using sigma welding, it is now possible to make high quality, on the spot repairs without disassembling the units — this results in an immediate savings of 5,000 dollars per pump.

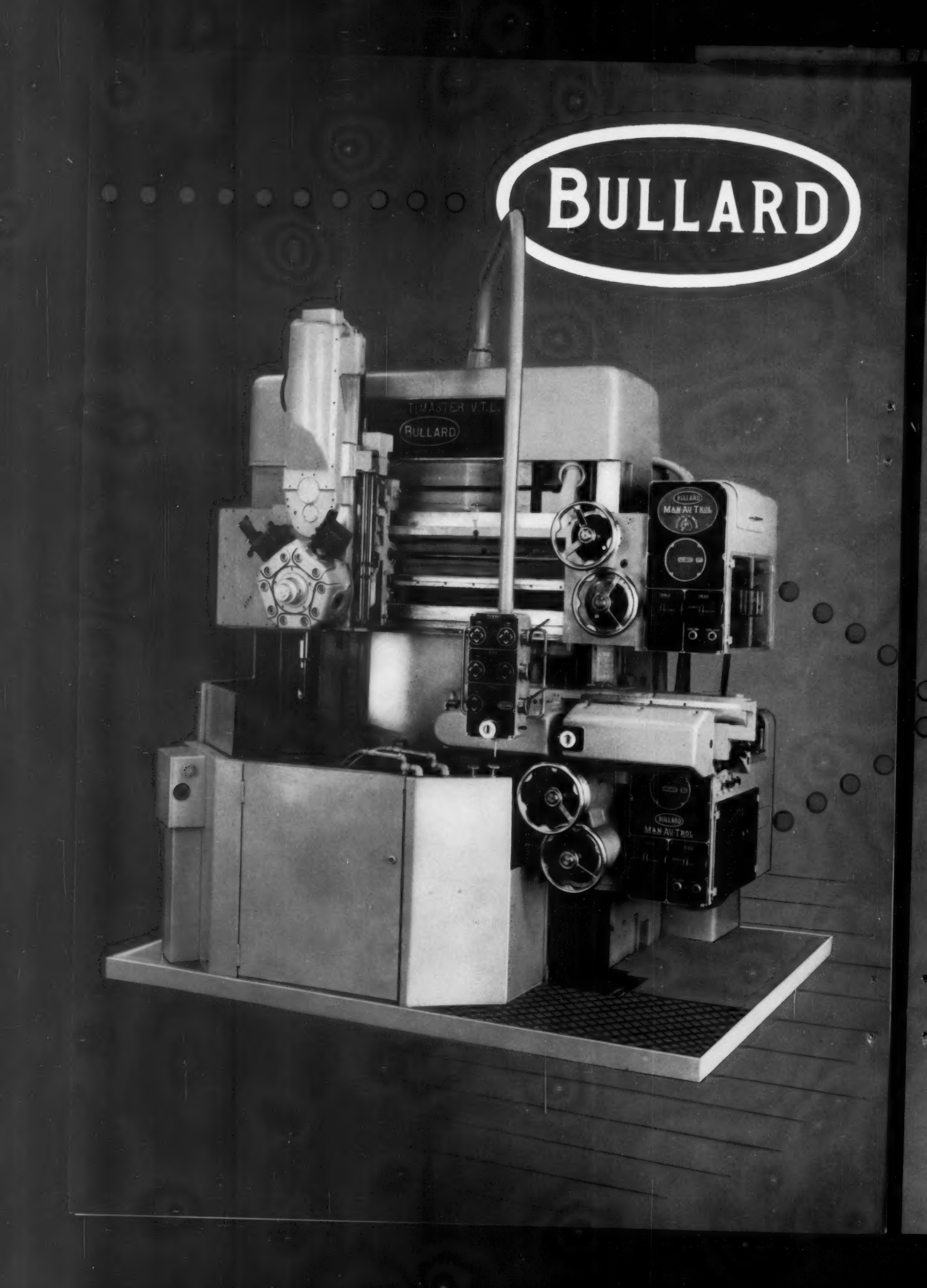
Shown above is a typical repair operation on one of the 22,000 hp. electric motor driven pumps. This crack is 11-in. long, 2½-in. wide, and 2-in. deep. The four pegs adjacent to the crack are strain check points. Frequent measurements made of the distance between them determines welding duration and the peening sequence necessary to control distortion which in this operation was less than 0.005 inch. The completed weld made with aluminum bronze wire has an excellent surface appearance and color match.

You can speed production and cut costs in your operations—find out more about sigma welding from your local LINDE representative . . . Start saving now, call him today.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto
(formerly Dominion Oxygen Company)

The term "Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.

Linde Trade-Mark


BULLARD
T-MASTER V.T.L.
BULLARD
MAN-AU-TROL
MAN-AU-TROL

don't BUY BULLARD *unless* YOU WANT THE BEST!

Yes, Bullard Cut Master, Model 75 with Man-Au-Trol Conversion Unit is the best . . . most versatile automatic Vertical Turret Lathe offered to industry today . . . . .

All operating functions are automatically initiated and controlled by one function control drum and two detector drums in Man-Au-Trol: Table Speeds (20 Available), Feeds (16 Available), Head Travel in feed or traverse, right or left, up or down or 45° in any quadrant and Turret Indexing.

Since the function control drum can be pre-set for a given job in advance, the machine down time for job change-over is reduced to a minimum.

The Man-Au-Trol Conversion Unit can be applied to any or all heads of Cut Master, Model 75 right in your plant.

Your Bullard Sales Engineer will be glad to explain the many other advantages offered by Man-Au-Trol — your best buy in an automatic vertical turret lathe — call him or write for our new catalog.

THE BULLARD COMPANY
286 Canfield Avenue • Bridgeport 2, Connecticut

Please send me a copy of the
NEW MAN-AU-TROL MODEL 75 CATALOG

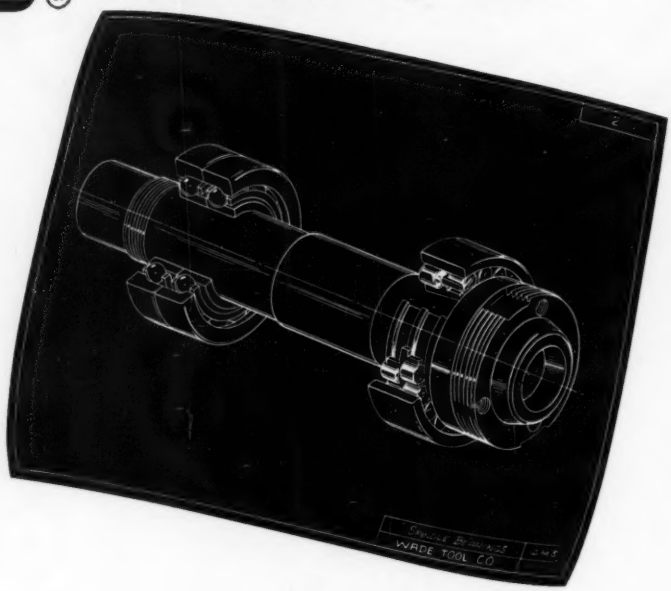
NAME_____

COMPANY_____ POSITION_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

the Wade® LATHE spindle

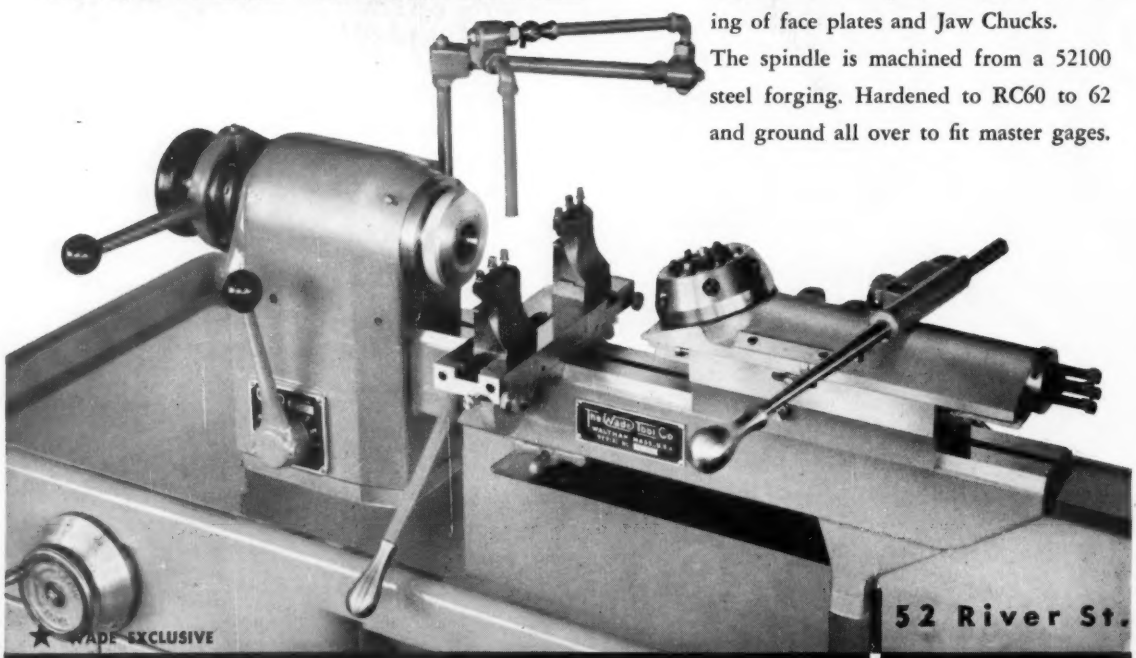


★ **BEARINGS** To assure continued production within close precision tolerances SKF Double row cylindrical roller bearings are used for maximum radial rigidity and the matched angular contact bearing insure adequate thrust capacity. Because of this bearing construction, the Lathe is guaranteed to turn true and round within .0002".

★ **SPINDLE NOSE** The Spindle nose is an American Standard A2-3" with the added exclusive Wade thread-lock feature. This provides fast, effective clamping and positive driving of face plates and Jaw Chucks.

The spindle is machined from a 52100 steel forging. Hardened to RC60 to 62 and ground all over to fit master gages.

the Wade® no. 73 HAND TURRET LATHE



★ WADE EXCLUSIVE

52 River St.

THE WADE TOOL CO.

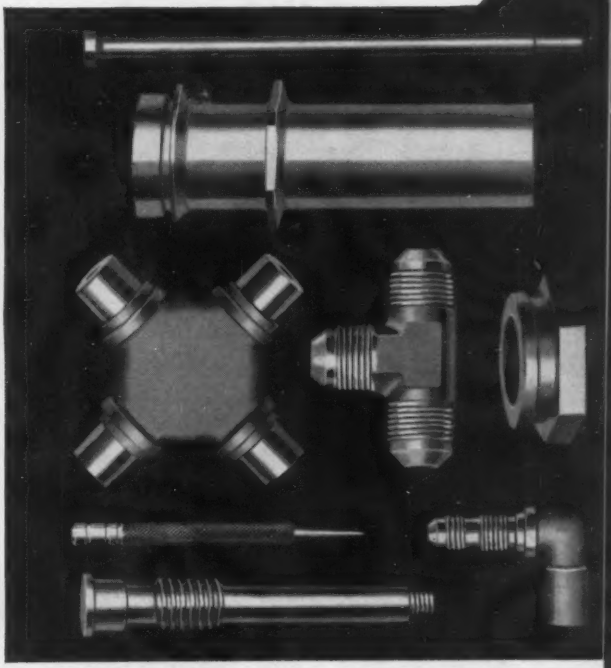
WALTHAM 54, MASS., U. S. A.

MAKERS OF PRECISION MACHINE TOOLS FOR AMERICAN INDUSTRY

For more information on products advertised, use Inquiry Card, page 243

for hollow milling . . . end forming and turning . . . for knurling, burnishing or threading—on short or long runs

On this Cleveland tapping machine, two Namco Vers-o-tools with circular hollow milling cutters prepare these forged steel rods for threading in the next station where two Vers-o-tools are equipped with circular ground thread chasers.



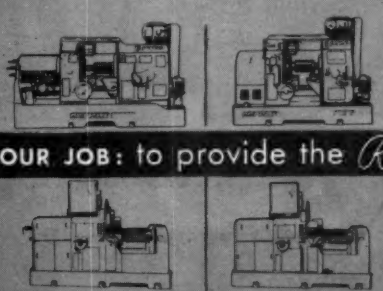
To do threading and turning jobs like these and thousands of others, better and cheaper, investigate the Vers-o-tool system. Catalog DT-52 describes the method and shows the complete line. Our representative will give you the answers on your jobs.

NAMCO VERS-O-TOOLS save time . . . tooling costs . . . additional grinding operations

Hollow milling, even to a very close micro finish, is three times faster with multi-cutter Vers-o-tool Heads than with single point tools. Knurling and burnishing jobs show similar time savings and accuracies. Threading also costs less per piece because with the Vers-o-tool "system" the guess-work is taken out of chaser grinding.

Further savings, too, in tool investment—chasers, cutters and rolls are interchangeable (size for size) in the same "double duty" Vers-o-tool heads.

24-hour deliveries on most standard stockable chasers and blocks—NC, NF, National taper pipe and Dry Seal.



OUR JOB: to provide the *Right Machine* for YOUR JOB

Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.

THE NATIONAL ACME COMPANY

179 EAST 131st STREET • CLEVELAND 8, OHIO

New! Revolutionary!

Colonial
ONE-WAY
Surface
Broacher

"Eliminates" Return-Stroke
"Eliminates" End of Stroke
"Doubles" Length of Stroke

For complete information on the new Colonial ONE-WAY surface broacher, ask for Bulletin VC-55 See it in operation at the Machine Tool Show.

MECHANICAL DRIVE
AC MOTOR
VARIABLE SPEED
HYDRAULIC OR
MECHANICAL FIXTURES
CARBIDE OR
HSS BROACHES
NO PIT REQUIRED
FOR LOW CEILING
LONGER TOOL LIFE

EXTREME ACCURACY
GUARANTEED
STROKE LENGTH
UP TO 200 INCHES
SPEEDS UP TO 50 FEET/MIN.
ONE LONG STROKE—
ONE PART
OR
MULTIPLE SHORT STROKES
ON MULTIPLE PARTS
CONTINUOUS OPERATION

PIONEERS OF H.S.S. BROACHING
COLONIAL
BROACH & MACHINE CO.
DETROIT 13, MICH.

UNIFIED BROACHING is the key to successful broaching

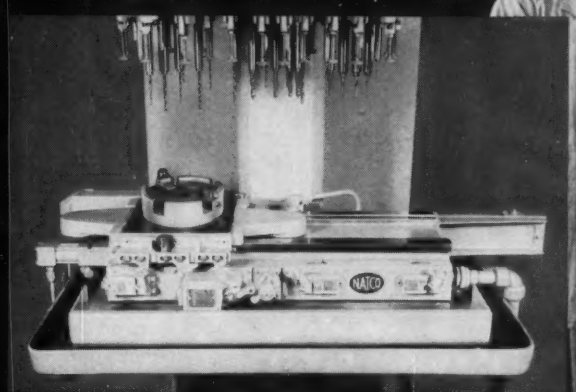
For more information on products advertised, use Inquiry Card, page 243

NEW NATCO DRILLER DOES WORK OF THREE MACHINES

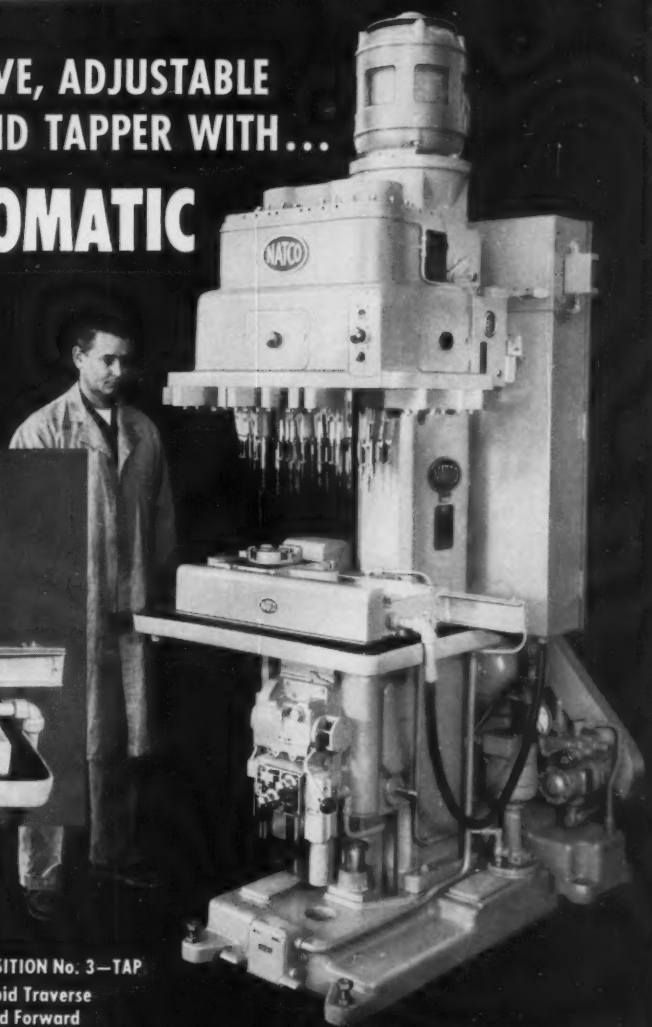
...DRILLS, CHAMFERS AND TAPS AUTOMATICALLY!

NATCO H-6 LIGHT SENSITIVE, ADJUSTABLE MULTI-SPINDLE DRILLER AND TAPPER WITH...

3 POSITION AUTOMATIC FIXTURE SLIDE



THREE POSITION AUTOMATIC FIXTURE SLIDE IN DRILL POSITION.



TYPICAL FEED CYCLE

POSITION No. 1—DRILL	POSITION No. 2—CHAMFER	POSITION No. 3—TAP
Load Part	Rapid Traverse	Rapid Traverse
Rapid Traverse	Feed Forward	Feed Forward
Feed Forward	Rapid Reverse	Feed Reverse
Rapid Reverse	Index to Position No. 3	Rapid Reverse
Index to Position No. 2		Index to Position No. 1

NATIONAL AUTOMATIC TOOL COMPANY, INC.
RICHMOND, INDIANA

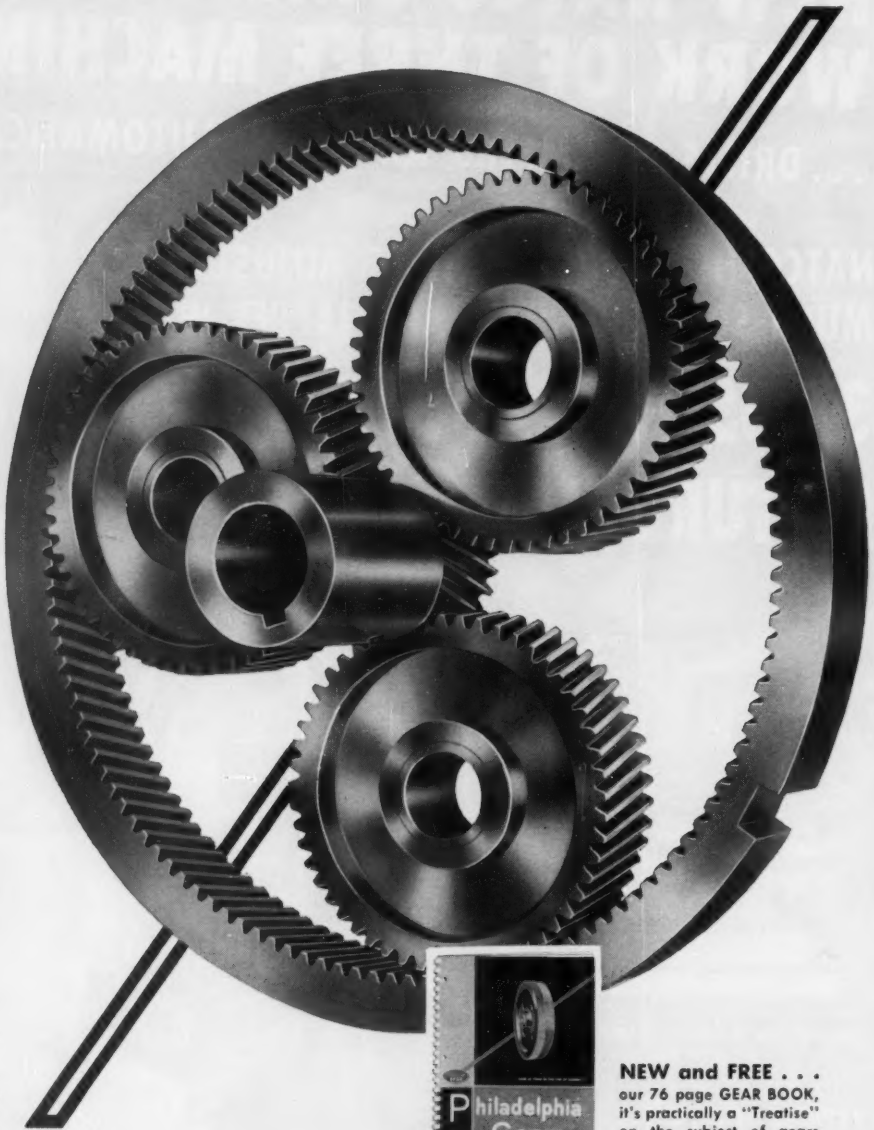
for answers to your Drilling, Boring, Facing and Tapping problems

Call a Natco Field Engineer

CHICAGO, *Room 203, 6429 W. North Ave., Oak Park*
DETROIT, *10138 W. McNichols Rd.*
BUFFALO, *1807 Elmwood Ave.*
NEW YORK, *35 Beechwood Ave., Mount Vernon*

NATCO

we know our gears "INSIDE-OUT"



Spur
Helical
Spur Internal
Helical Internal
Rack
Herringbone
Worm
Non-Metallic
Splines
Coniflex Bevel
Spiral Bevel
Zerol
Hypoid
Intermittent
Sprockets

Contract Machine Work

NEW and FREE . . . our 76 page GEAR BOOK, it's practically a "Treatise" on the subject of gears and gearing.

PHILADELPHIA GEAR WORKS
INCORPORATED

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
BALTIMORE • CLEVELAND
Virginia Gear & Machine Corp., Lynchburg, Va.
Industrial Gears & Speed Reducers • LimiTorque Valve Controls
Established 1892

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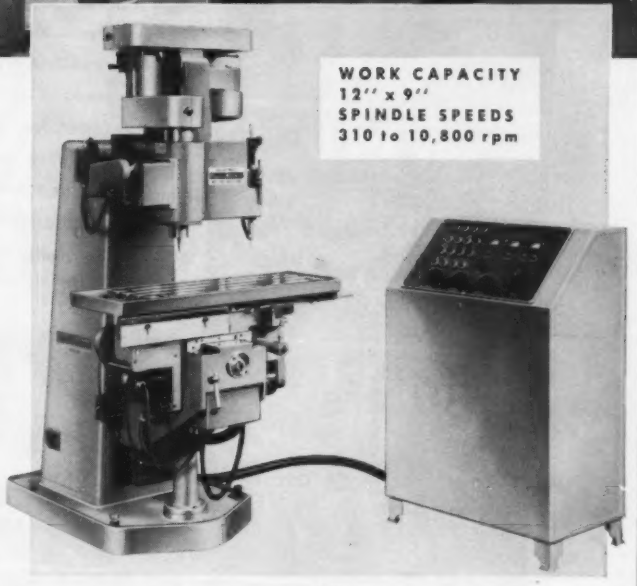
NEW! UNIQUE! PRECISE!



PRATT & WHITNEY

VELVETRACE (TRADEMARK)

MILLING MACHINE

AN ENTIRELY NEW, UNIQUE TYPE OF TRACER CONTROL . . . follows the finest detail of any 3-dimensional model with extreme accuracy . . . but WITHOUT TOUCHING IT. Utilizes a short spark gap between tracer and model for control. Cannot damage any model, however soft or fragile, even when using the smallest diameter tracer. There is no mechanical motion in the tracer . . . and therefore no positional offset or time lag.

AUTOMATIC OPERATION

Spindle, table and carriage are driven through new type, specially designed magnetic clutches which provide maximum sensitivity, continuously variable speed control, and eliminate backlash. Machine can be set to cut 3-dimensional shapes (including square walls) automatically with either table travel and carriage feed, or carriage travel and table feed. Spindle quill "roll feeds" in precision preloaded ball bearings . . . assuring that original high accuracy and rigidity are maintained indefinitely.

SEND NOW FOR COMPLETE INFORMATION

Write on your Company letterhead for your free copy of Circular No. 590 . . . or phone the P&W Branch Office nearest you.

MODERNIZE with PRATT & WHITNEY REPLACE FOR PROFIT

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U.S.A.

BRANCH OFFICES . . BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI CLEVELAND • DETROIT • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH ROCHESTER • SAN FRANCISCO • ST LOUIS • EXPORT DEPT., WEST HARTFORD

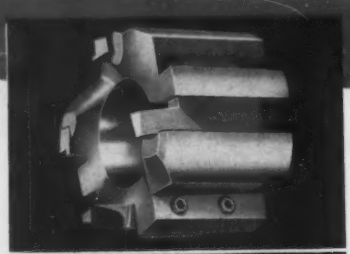
FIRST CHOICE FOR ACCURACY SINCE 1860

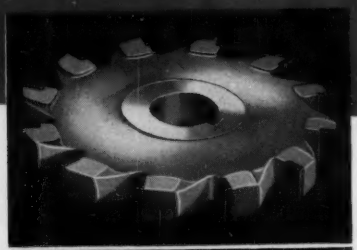
MACHINE TOOLS • CUTTING TOOLS • GAGES

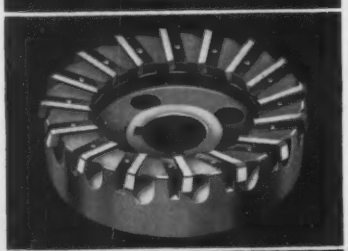
NEW! NEW! NEW!

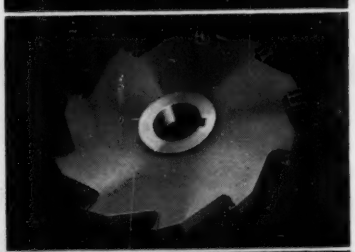
SUPER TOOL STANDARD MILLING CUTTERS NOW IN STOCK WITH CARBOLOY® GRADE 370

(For your steel-cutting applications)



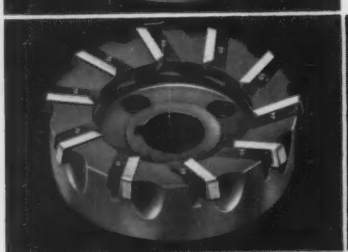


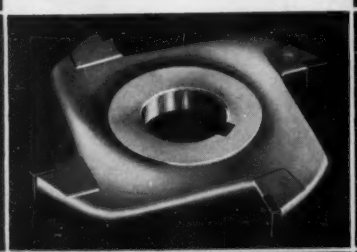


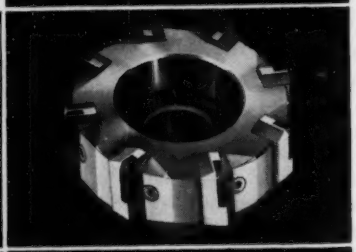


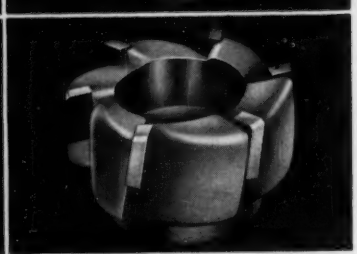
Super Tool's Standard Milling Cutters are now available for immediate delivery with Carboloy Grade 370. This new series of steel-cutting carbide *cuts faster, lasts longer*—operates efficiently at extremely high temperatures as proved by hundreds of actual production tests.

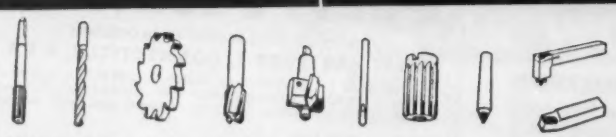
Write now for catalog No. 55, describing the complete line of Super Carbide Tools.











QUALITY CARBIDE TOOLS SINCE 1927

Super TOOL COMPANY

DEPT. 362, 2158 HOOVER RD. • DETROIT 13, MICHIGAN

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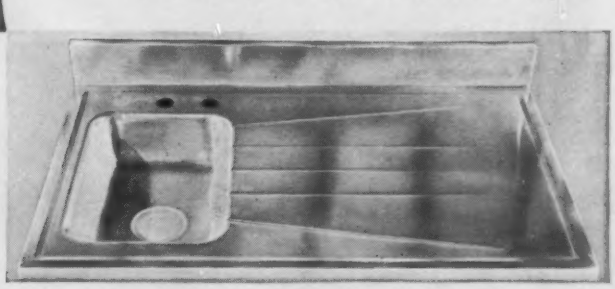
How a **CLEARING** Hydraulic Helped Elkay Reach a Big, New Market

For years the stainless steel sinks manufactured by Elkay Mfg. Co. in Cicero, Illinois had been considered a "class" item confined in consumer sales to the "carriage" trade. The sinks were made by laborious methods which required cutting corners of a flat sheet, bending the sides, and hand welding and polishing the corners smooth.

Elkay made a profitable decision when they purchased their first Clearing column type hydraulic press. They standardized on the sink bowl size so that sinks are now drawn quickly and economically in a single press operation. Elkay Lustertone stainless steel sinks are now within reach of the average homeowner. Elkay's confidence in Clearing equipment was demonstrated when they purchased their second column-type hydraulic.

Clearing presses make kitchen sinks, and practically everything else, quickly and economically. If you are planning conversion to more efficient production on a press, Clearing engineers are at your service.

Another popular Elkay item is this stainless steel unit, also manufactured economically with the help of a Clearing press.



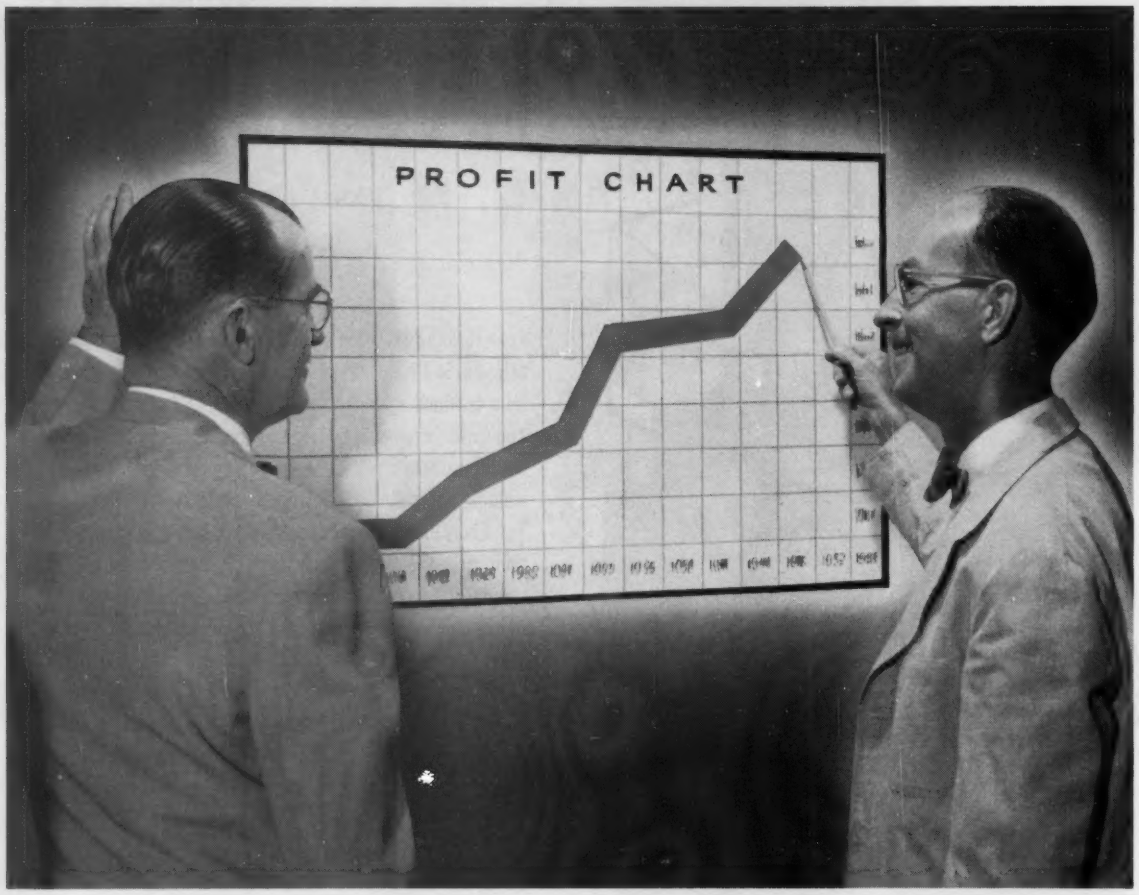
FREE—*New 40-page catalog on Clearing hydraulic presses. Write for it today.*

CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION DIVISION OF ***U.S. INDUSTRIES, INC.***

6499 WEST 65TH STREET • CHICAGO 38, ILLINOIS • HAMILTON PLANT—HAMILTON, OHIO

ANTISEP the all-purpose water-soluble cutting base



Machine tools pay off in extra profits when **ANTISEP** is on the job

Since profits from machining depend primarily on production, using Antisep All-Purpose Cutting Base is the wisest thing you can do.

Because, *you get more output per machine* with Antisep. It enables you to increase both speed and feed. It has anti-welding properties and exceptional lubricity that produce better finishes with minimum rejects.

Antisep, besides, is most economical to use. Low initial cost, combined with solubility in an effective 25-to-1 dilution with water, means you pay 8c per gallon in the machine!

Make a decision now to increase the profits from your machining operations. Call the Houghton Man to arrange a convincing test. Meantime, get latest Antisep bulletin by writing E. F. Houghton & Co., 303 West Lehigh Avenue, Philadelphia 33, Penna.

ANTISEP All-purpose cutting base

. . . a product of

E. F. HOUGHTON & CO.

PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

For more information on products advertised, use Inquiry Card, page 243

Gear production 5 times faster with this generator!

• Bevel gears with localized tooth bearing cut from the solid in *one* operation by the new Gleason No. 104 Straight Bevel Coniflex® Generator. Production rates increased 5 to 1. Excellent quality is maintained. Quick set up makes machine ideal for small or large quantity production.

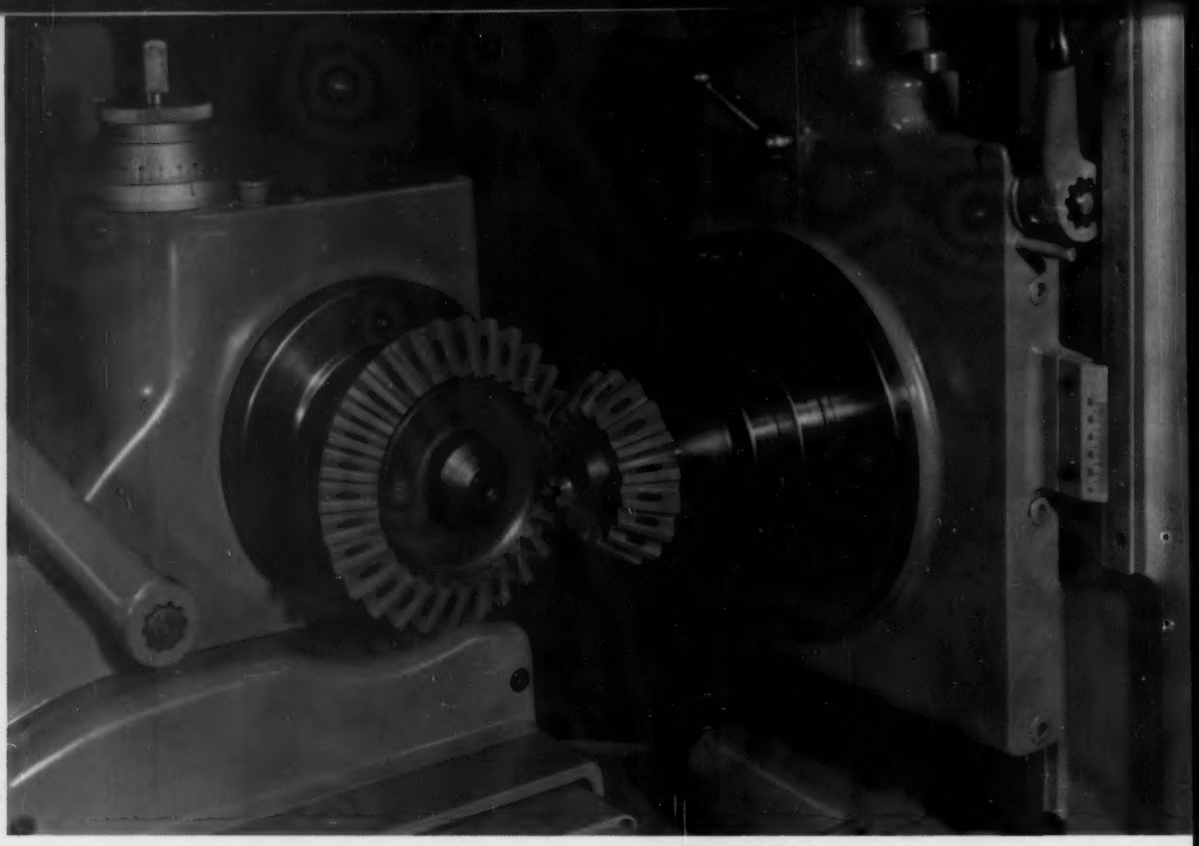
On the reverse side are the tester and sharpener used with the No. 104 Generator. A complete unit of generator, tester and sharpener gives you all of the facilities you require for quality Coniflex gear production.

Write us. We will be pleased to send you bulletins and further information.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.



Complete your gear production facilities with these auxiliary machines

• In addition to the generator, gear testing and cutter sharpening equipment is absolutely necessary for economical bevel gear production. The No. 13 Universal Gear Tester shown above, and the No. 104 Coniflex® Cutter Sharpener shown left, are the companion machines used with No. 104 Straight Bevel Coniflex Generator on the reverse side of this page.

The No. 13 Tester provides a running test for a wide range of bevel and hypoid gears. Smoothness and quietness of operation, tooth bearing, tooth size, concentricity and tooth spacing errors are all checked by the running test. It simulates actual operating conditions and determines if the gears are correct before final assembly.

Accurate sharpening of the No. 104 Sharpener assures longest cutter life, best finish on gears, and exact duplication of results after cutters are sharpened or replaced.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

HOW TO COMPLETE THE JOB *Faster...*

AND STILL GET MORE ACCURATE PARTS!

JOB FACTS

- **Roughing and finishing operations performed on this SAE 120-121 Cast Iron Housing include multiple recessing shown in sketch. The three grooves were rough recessed in one station and finished recessed together with front and rear counterbore in another position.**
- **Three rough boring passes were finish-reamed with accelerated reaming attachment in one pass.**
- **Carbide tooling used throughout.**

When you tool up jobs this way on an ACME-GRIDLEY MULTIPLE SPINDLE CHUCKING AUTOMATIC, you often *complete* the parts in one setup—and they are more accurate and uniform because rehandling and rechucking for second operation work is eliminated.

And the corollary to this is that man hours are released for other work—and space formerly needed for second operation work is saved.

On this cast iron housing, all 17 operations were performed simultaneously, with a *single completely carbide-tooled setup*—on an Acme-Gridley 8-inch, 8-spindle chucker. And because the work on all spindles is always done within the time required for the longest single cut, the floor-to-floor time on this job was at the rate of 61 *completed* pieces per hour.

This is where multiple spindle *planning* pays off.

And this is where the vast experience of National Acme tooling engineers (they have helped plan the cost-reduction of more than 300,000 jobs) wins and holds preference for Acme-Gridley bar and chucking automatics—in hundreds of shops.

These engineers will give you sound advice; unbiased advice in both job setup and equipment—from the world's only manufacturer of a *complete line* of multiple spindle bar and chucking automatics and fully automatic turret lathes.

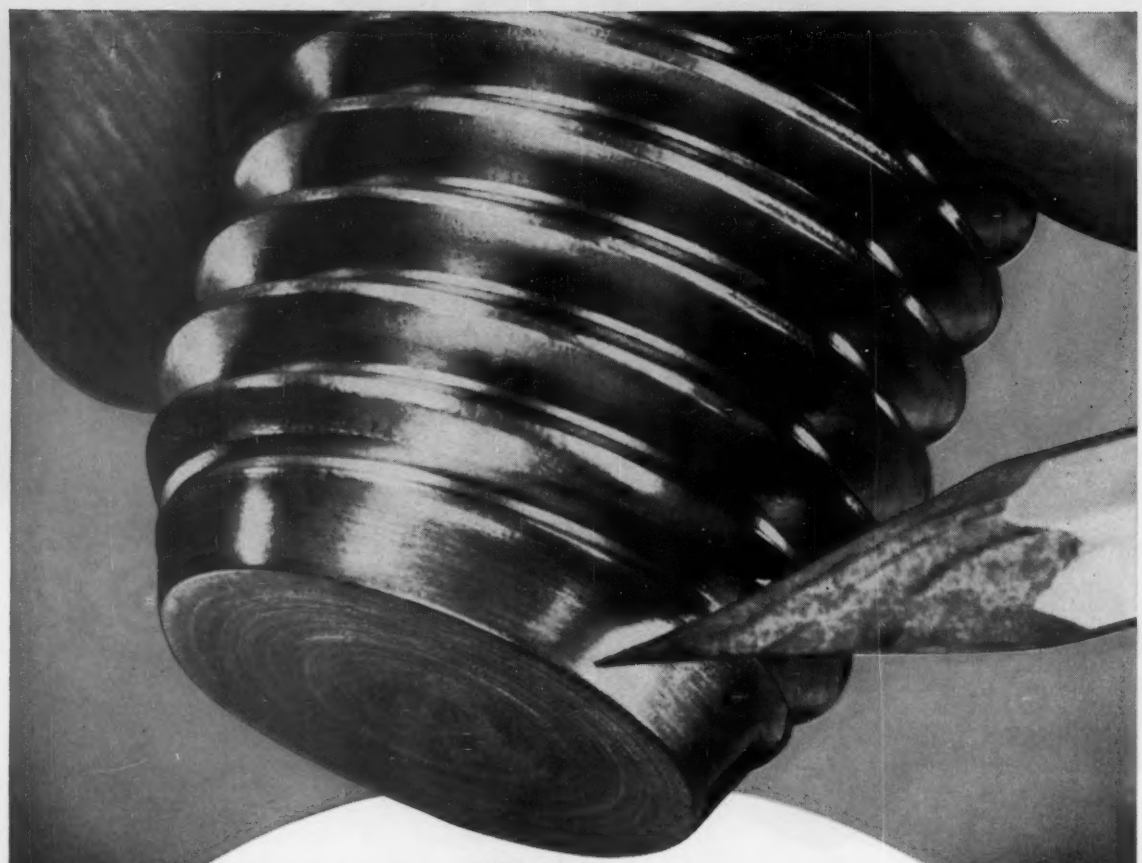
Send for Catalog CM-51 or ask for our recommendations

OUR JOB: to provide the *Right Machine* for YOUR JOB

Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.

THE NATIONAL ACME COMPANY

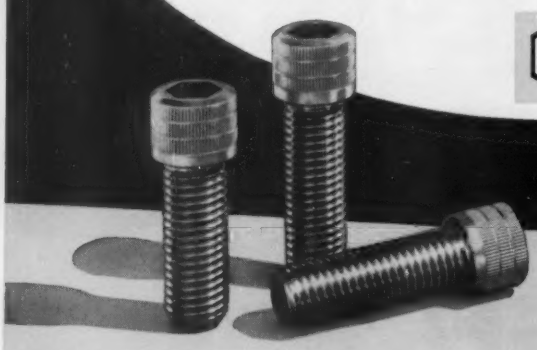
179 EAST 131st STREET • CLEVELAND 8, OHIO



NEW

Allen leader point cap screws

Dropping, knocking against metal surfaces and faulty line-up are major causes of damaged threads. Allen's new unthreaded leader point substantially reduces the causes of screw thread injury, or damage to threaded holes. Grip Heads, precision fit sockets that adhere to the key, *plus* the new leader points, make Allens the world's easiest starting cap screws, particularly in inaccessible spots. Sold *only* thru leading Industrial Distributors.



ALLEN HEAD

ALLEN

MANUFACTURING COMPANY

Hartford 2, Connecticut U.S.A.

For more information on products advertised, use Inquiry Card, page 243

"AMERICANS" WORKING FOR NORDBERG

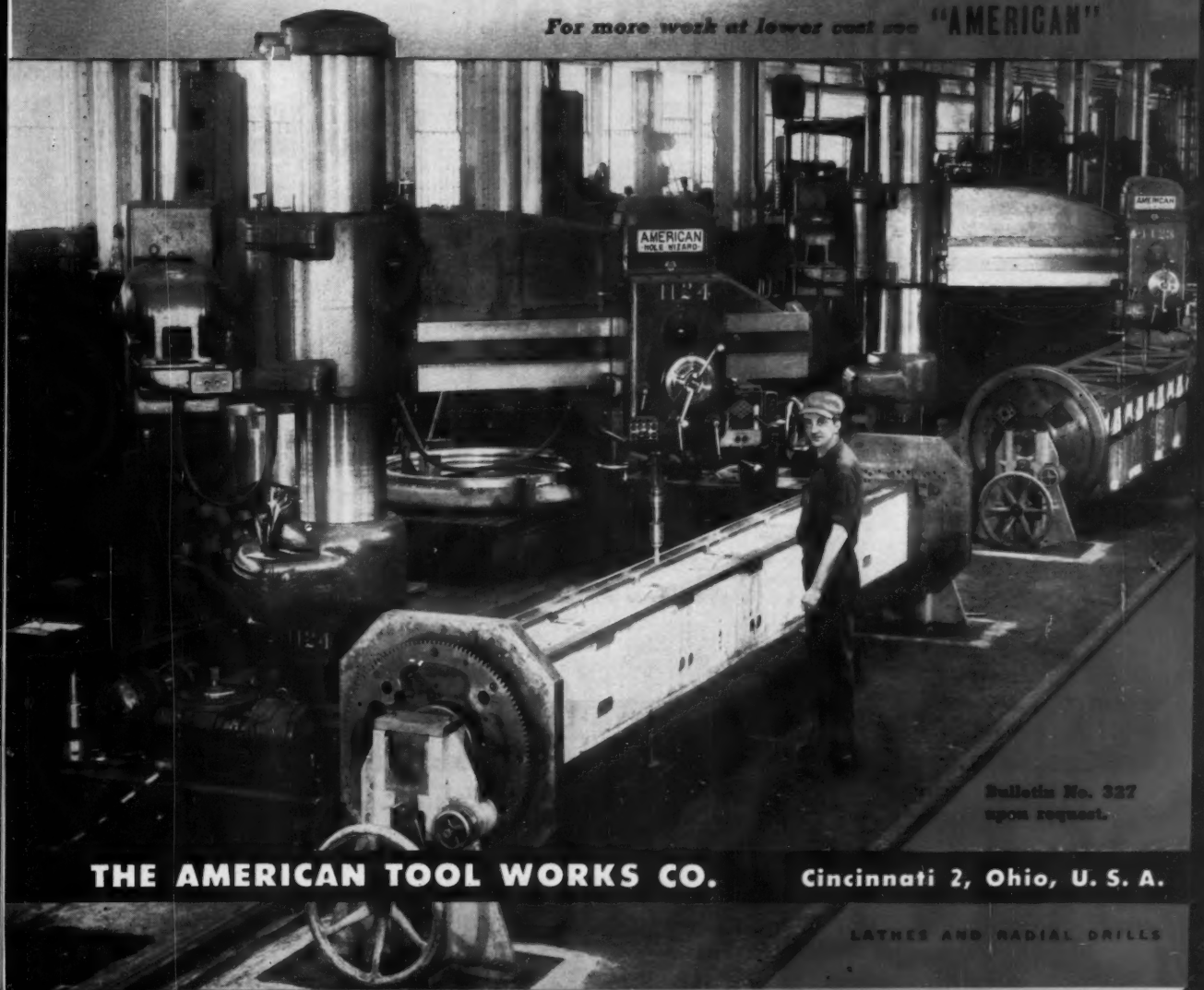
helping to profitably produce the quality products for which Nordberg Manufacturing Company of Milwaukee, Wisconsin is known the world over.

These "AMERICAN" Track Type Hole Wizard Radials mounted on mobile bases speed up drilling, tapping and boring operations in long, heavy work pieces by bringing the tool to the work rather than moving the work to the tool.

The work pieces are mounted in elaborate trunnion jig fixtures so different work planes may quickly be presented to the tool and a high degree of accuracy maintained.

The quality of Nordberg products is universally recognized. We are proud indeed that so many "AMERICAN" Lathes and Radial Drills contribute to it.

For more work at lower cost use "AMERICAN"



Bulletin No. 327 upon request.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

JONES & LAMSON offers you THIS COMBINATION

GREATER SAVINGS

FINEST MACHINES

EASIEST PROCUREMENT

Modern machine tools that produce greater work accuracy at lower costs than ever before.

Scientific research in machining methods, metallurgy, tool geometry and inspection procedures.

Realistic Procurement — you have your choice of several sound financing methods, plus the advantages of new tax laws with more equitable write-offs.

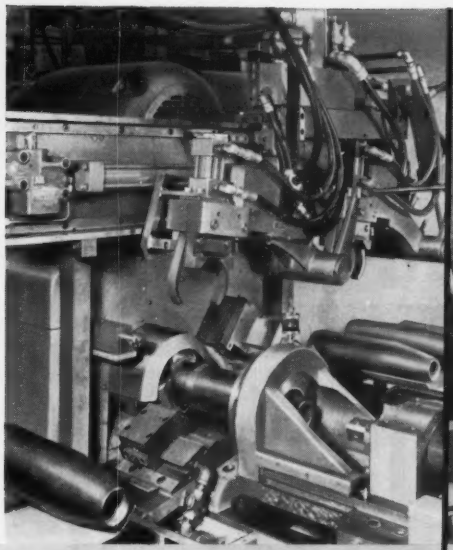
From initial survey of your production requirements right through to delivery and installation of new equipment, every phase of J&L's Replacement Program service is complete, competent and reliable.

The man who needs a machine tool . . . is already paying for it.

JONES & LAMSON MACHINE COMPANY

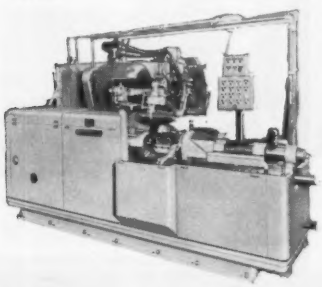
512 Clinton St., Dept. 710, Springfield, Vt., U. S. A.

UNIVERSAL TURRET LATHES • FAY AUTOMATIC LATHES
AUTOMATIC DOUBLE-END MILLING & CENTERING MACHINES • AUTOMATIC THREAD & FORM GRINDERS
OPTICAL COMPARATORS • AUTOMATIC OPENING THREADING DIES & CHASERS



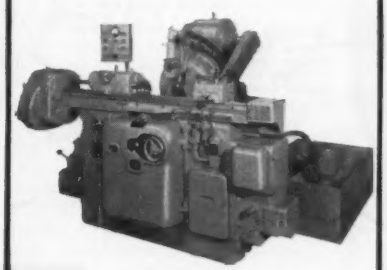
AUTOMATIC HANDLING

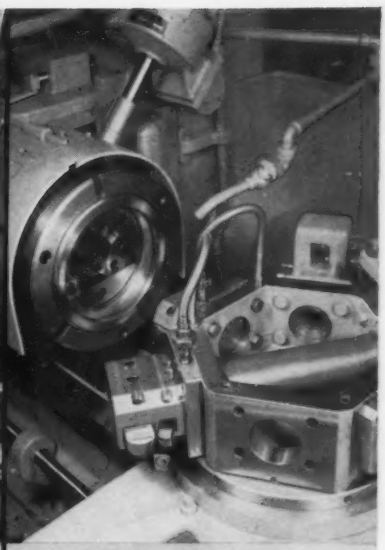
Completely automatic operation of this Fay Automatic lathe, including *loading, machining, chip and coolant disposal* and *unloading*, ups production to 180 pcs. per hour at 100% efficiency in the machining of these shells.



NEW METHODS

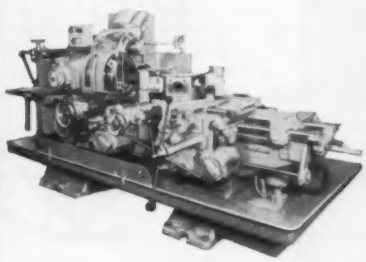
By grinding this worm (stock removal .1235″ — one pass) on a J&L 6 x 36″ Automatic Thread Grinder, production is increased 160% per machine over previous methods.





VERSATILE TOOLING

High production methods of tooling for automatic lathes were simplified and applied to three 7B J&L Universal Turret Lathes. Inner and outer Ball Bearing Races are produced on the same machines. Set up time from one lot to the next does not exceed fifteen to twenty minutes per machine.



Jones & Lamson's unique Procurement Plan offers you a choice of methods for procuring new, high-efficiency equipment. You may buy outright; pay-from-productivity on a variety of bases, at interest rates of 3¼% and lower (add-on); or you may use any of several variations of a truly flexible lease plan.

MACHINE TOOL DIVISION

Valuable information is yours for the asking. Simply fill in the coupon below, *clip it to your letterhead*, and mail.

Jones & Lamson Machine Company
512 Clinton St., Dept. 710,
Springfield, Vermont, U. S. A.

Please send me the Jones & Lamson *Machine Tool Replacement Information Kit.*

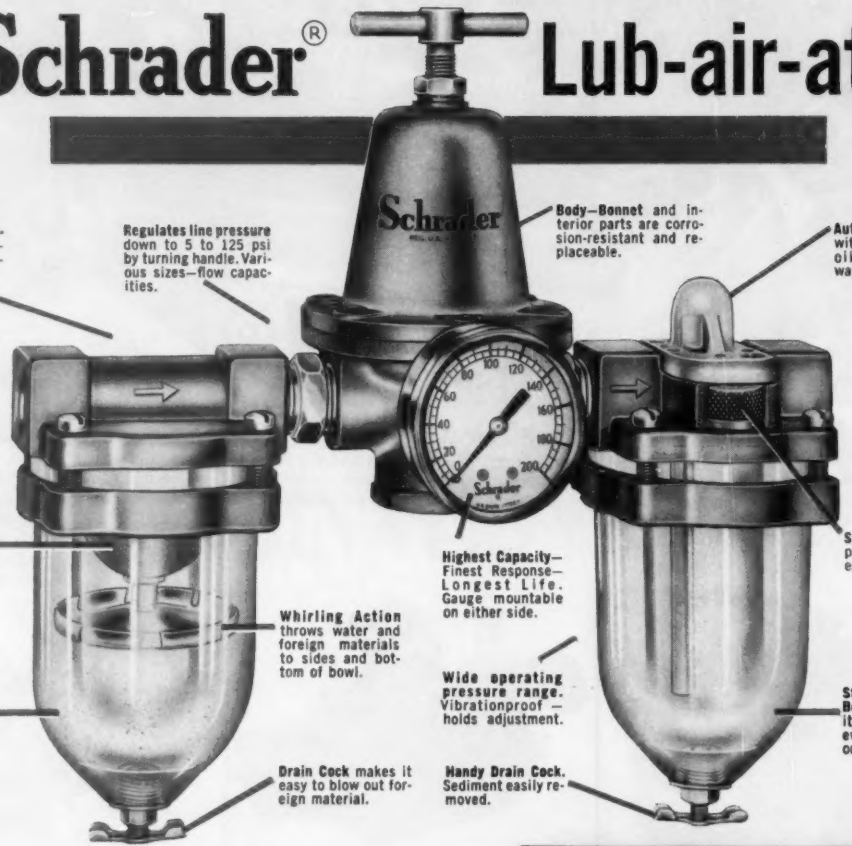
Name.....

Title.....

NEW!

FILTER...REGULATE...LUBRICATE with this

Schrader® Lub-air-ator


Schrader
Finest sintered filtering — automatic — completely rustproof—various sizes.
Regulates line pressure down to 5 to 125 psi by turning handle. Various sizes—flow capacities.
Body—Bonnet and interior parts are corrosion-resistant and replaceable.
Automatic Lubrication with sight feed. Adjust oil flow while you watch.
Sintered Bronze Filter Minimum pressure drop. Removable filter easily cleaned without disturbing piping.
Whirling Action throws water and foreign materials to sides and bottom of bowl.
Highest Capacity—Finest Response—Longest Life. Gauge mountable on either side.
Sliding-Seal covered port permits quick, easy refill.
Wide operating pressure range. Vibrationproof — holds adjustment.
Sturdy Transparent Bowl permits constant visual policing.
Sturdy Transparent Bowl—½ pint capacity. Oil level always evident. Refill without shutting off air.
Drain Cock makes it easy to blow out foreign material.
Handy Drain Cock. Sediment easily removed.

Easily maintained. No moving parts—can be serviced without disturbing pipe connections.

Now! An all-in-one installation! The Schrader LUB-AIR-ATOR. This new, quality unit is designed to do these three important jobs: *filter* clean the air as it moves through system—*regulate* air to proper pressure requirements—*lubricate* moving parts in the correct amount to minimize wear and friction. End result: your valuable air tools give longer trouble-free service.

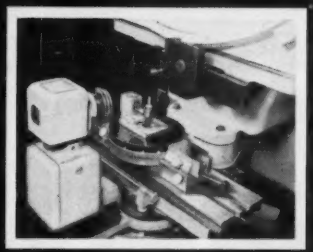
Use a Schrader LUB-AIR-ATOR wherever you need dependable, safe air service. And . . . if you design products with air equipment and controls—"build in" the Schrader LUB-AIR-ATOR. Its quality complements *your* equipment. For a fully illustrated specification sheet write us! Act now! Address A. SCHRADER'S SON, Division of Scovill Manufacturing Company, Incorporated, 434 Vanderbilt Avenue, Brooklyn, New York.

Schrader
REG. U. S. PAT. OFF.

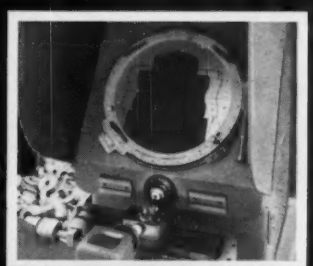
LEADERS IN AIR CONTROL SINCE 1844

JONES & LAMSON OPTICAL COMPARATORS

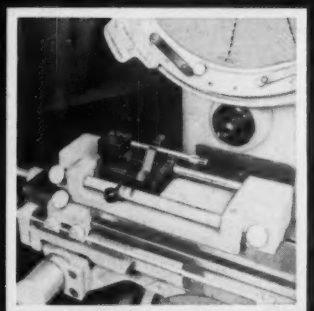
Precise . . . Rapid . . . Flexible . . . Easy-to-operate



A J & L Comparator, with special fixture and chart, easily and perfectly measures a 3-dimensional cam. This is traditionally one of the most difficult of all inspection jobs.



This inexpensive J & L Comparator is precisely measuring four small parts, of different sizes, with the same setup.



Shoulder lengths can be measured to closest tolerance swiftly and accurately with a J & L Comparator. The fixture shown here accommodates a wide variety of parts.

DROODLES

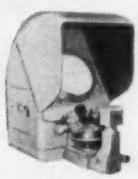
by ROGER PRICE

"DUMB-DUMB BULLET"

Interesting object, the dum-dum bullet. Invented by Sir Basil Fleemster, the famous explorer and hunter. A kind-hearted man, Sir Basil figured that bullets made of extra-soft lead would prove less distasteful, so to speak, to his prey.

He tested his theory on a hunting trip along the lower Zambesi. After Sir Basil had fired on a herd of antelope, his Number One bearer came running up, crying "Bad gnus, sahib — bullet holes big like soup plates!" Fleemster was so devastated by this pathetic turn of events, and the even more pathetic pun, that he hightailed it forthwith to his farm in Sussex, where he now raises peonies. Ah, well — not the first man to be led astray by softheadedness!

Don't *you* be led astray! Be sure to get all the facts on Jones & Lamson Comparators. These precision-built optical instruments measure and inspect all sorts of objects and parts, ranging in size from the tiniest screw to large turbine blades. J & L Comparators make inspection swift and sure, with accuracy to .0001". Whatever the product or component that you make, if inspection, measurement and quality control are important in your production, it will pay you to investigate J & L Comparators. Send this coupon *today!*



Bench Model BC-14D

Pedestal Model FC-30

Pedestal Model PC-14

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 512 Clinton Street, Springfield, Vermont, U.S.A.

- ☐ Please send me Comparator Catalog 402-C (describes complete line). I'd like to see a showing of the movie(s)
- ☐ "What's the Difference" (describes Comparator construction and principles of operation)
- ☐ "Beyond the Shadow of a Doubt" (describes interesting Comparator applications)

*Name*_____ *Title*_____

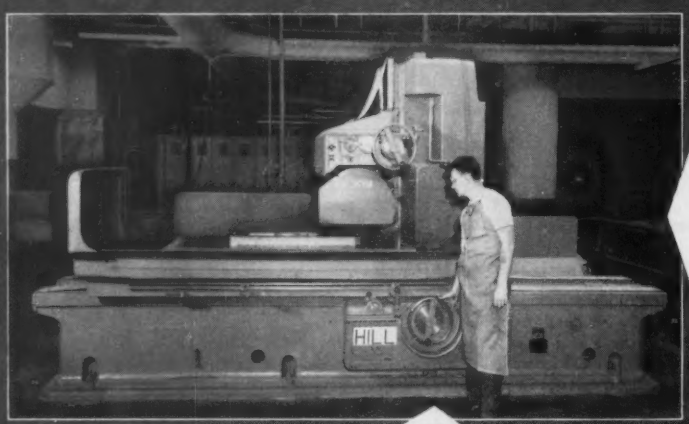
*Company*_____

*Street*_____

*City*_____ *Zone*____ *State*_____

What HILL GRINDERS Have Done for Others They Will Do for YOU!

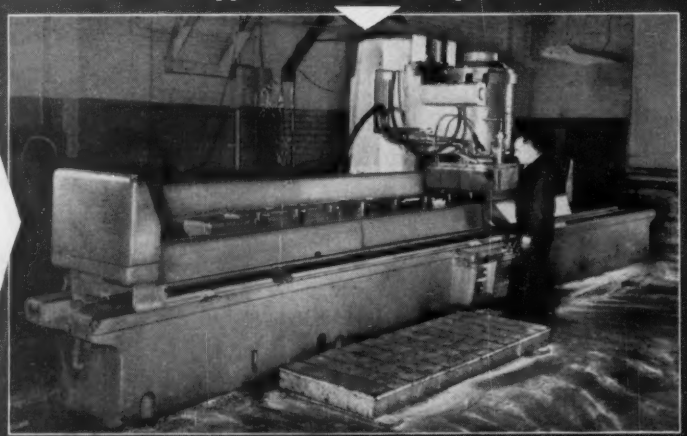
- *Produce a smoother finish and closer tolerances.*
- *Increases man-hour production.*
- *Actual case histories prove definite worthwhile dollar savings over other methods*



Use the "Hill" Horizontal Spindle Grinder for a wide range of grinding — flats, angles, irregular and special shaped surfaces — ideal for maintaining close tolerances with low micro inch finish. Made in table widths of 18", 24", 30" and 36" — table lengths from 5 to 20 feet.

- **Built in both Horizontal Spindle and Vertical Spindle types.**
- **Choose the most efficient type for YOUR requirements.**

Use the "Hill" Vertical Spindle Grinder for rapid stock removal and accurate grinding of flat surfaces — recommended for accuracy, speed and finish — features that mean increased precision production. Made in table widths of 18", 24" and 30" — table lengths from 5 to 20 feet.



HILL ACME INDUSTRY

THE HILL ACME COMPANY

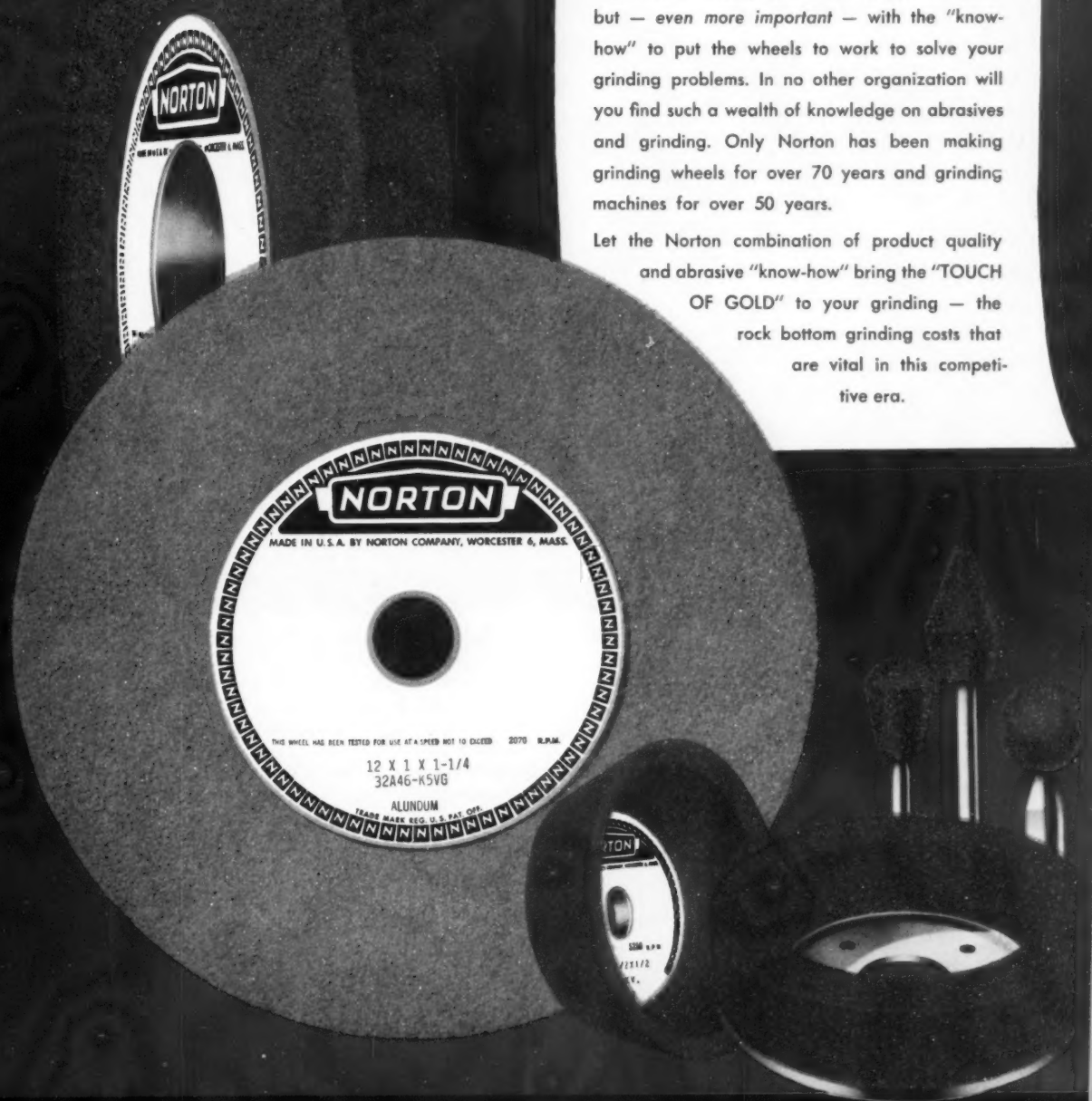
1209 WEST 65th STREET • • • CLEVELAND 2, OHIO

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

NORTON KNOW-HOW can bring the "TOUCH OF GOLD" to your grinding

TODAY'S high speed, automated grinding methods call for better grinding wheels. Today's new and improved metals call for better grinding wheels. Norton is ready. And not only with grinding wheels developed to meet today's demands but — *even more important* — with the "know-how" to put the wheels to work to solve your grinding problems. In no other organization will you find such a wealth of knowledge on abrasives and grinding. Only Norton has been making grinding wheels for over 70 years and grinding machines for over 50 years.

Let the Norton combination of product quality and abrasive "know-how" bring the "TOUCH OF GOLD" to your grinding — the rock bottom grinding costs that are vital in this competitive era.


NORTON
NORTON
MADE IN U.S.A. BY NORTON COMPANY, WORCESTER 6, MASS.
THIS WHEEL HAS BEEN TESTED FOR USE AT A SPEED NOT TO EXCEED 2070 R.P.M.
12 X 1 X 1-1/4
32A46-K5VG
ALUNDUM
TRADE MARK REG. U.S. PAT. OFF.

Making better products . . . to make your products better

Norton Service

can help you cut your grinding costs

PRODUCT COMPLETENESS

It means just the right wheel for each of your grinding jobs — wheels developed in the Norton research laboratories especially to meet today's exacting demands — it includes wheels of the exclusive 32 ALUNDUM abrasive and the new record-breaking G and K bonds. For you it means lower cost grinding. And if it's abrasive you use it also means the right type for each job — whether it's polishing, lapping, tumbling or pressure blasting.

ENGINEERING HELP

You can be sure that Norton engineering assistance will give you the full benefit of Norton product variety. Right near you there is a Norton Abrasive Engineer or a Norton factory-trained distributor representative who will see that you get exactly the right wheel for each grinding job — the wheel that will do the job at lowest cost. And to help your men use the wheels to best advantage there is a vast library of Norton know-how books and motion picture films.

DETROIT

PHILADELPHIA

CHICAGO

CLEVELAND

PITTSBURGH

HANDY STOCKS

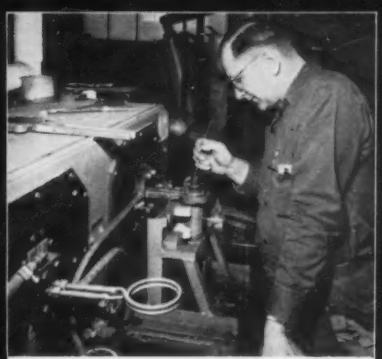
When the correct wheels for your jobs have been determined they, too, are handy to you — by the thousands in the five Norton warehouses and on the shelves of Norton distributors in over 225 cities of the United States. And these local stocks are backed by the gigantic stock rooms in the mile-long Norton Worcester plant — the world's largest grinding wheel plant. Serving foreign countries are seven Norton branch grinding wheel plants and distributors in all principal cities.

Sales Offices: New York (Teterboro, N. J.)
Hartford, St. Louis, Los Angeles

NORTON
ABRASIVES

NORTON COMPANY, WORCESTER 6, MASS.
BEHR-MANNING DIVISION, TROY, N. Y.
Export: Norton Behr-Manning Overseas Inc., Worcester, Mass.

JACK & HEINTZ Saves $15.84 per hour...



Jack & Heintz Inc. silver brazes over 25 different parts on this 15 KW, 10,000 cycle TOCCO machine.

with TOCCO* Induction Brazing

Brazing Costs Down

When Jack & Heintz engineers switched from torch brazing to automatic induction, brazing cost of these inverter brush mounts fell from $.05 to $.006 each —a reduction of 83% in direct labor costs alone! Additional savings result because less cleaning is required after TOCCO, and fuel costs are much lower, too.

Brazing Production Up

While costs dropped, production on the part zoomed —from 40 to 360 brazed assemblies per hour. Furthermore, rejects and scrap, formerly high, are now negligible.

Versatility

The part shown is just one of over 25 parts, large and small, which alert J & H engineers have converted from old-fashioned brazing methods to modern, automatic TOCCO. Overall brazing costs (TOCCO brazing versus former methods used) are down 75%—brazing speed, up 100%.

* * *

If the manufacture of *your* product involves brazing, heat-treating, forging or melting of ferrous or nonferrous metals, don't overlook TOCCO as a sound method of increasing production, improving product quality and slashing costs.

THE OHIO CRANKSHAFT COMPANY

TOCCO

Mail Coupon Today

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. M-10, Cleveland 5, Ohio

Please send copy of "Typical Results of TOCCO Induction Brazing and Soldering".

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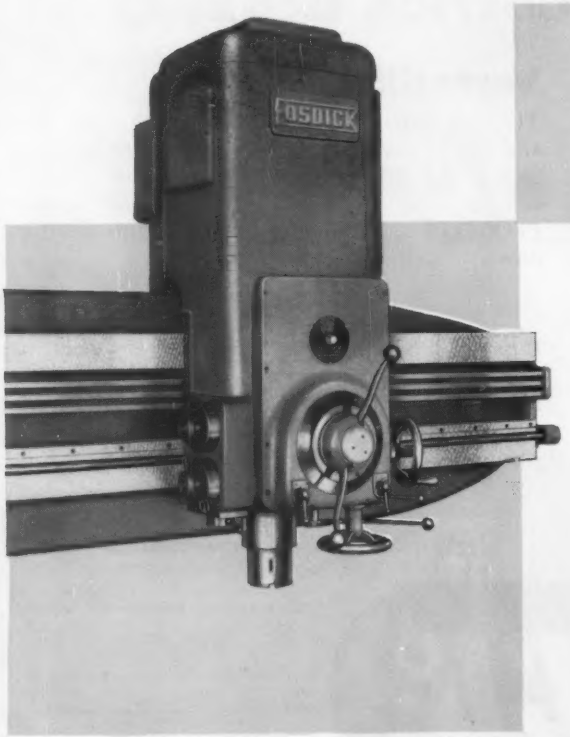
City_____ Zone____ State_____

With the NEW FOSMATIC Radial Drill

Pre-select Feeds and Speeds

All the new features needed by the modern machine shop have been designed into the new Fosmatic Radial Drill. Pre-selected feeds and speeds for a new degree of speed and operator convenience. Spindle speeds up to 3000 rpm to suit today's high-production requirements. Engineering refinements throughout to give you the rigidity you need for fast precision drilling.

Feeds and speeds are selected on dials at left side of the head, usually while waiting for a drilling operation to be completed. Shifting is accomplished by raising the spindle control lever slightly in its neutral position. Feed is engaged by pressing a button on either of the quick-return handles; feed is disengaged either by depth control or pressing one of the buttons. Other convenient controls at the head — Single lever elevates arm or traverses head (hydraulic variable rapid traverse). Hydraulic column clamp. Hydraulic arm clamp, safety-interlocked with elevating lever. Hand feed and traverse to the head. The tool ejector eliminates need for tang driver.

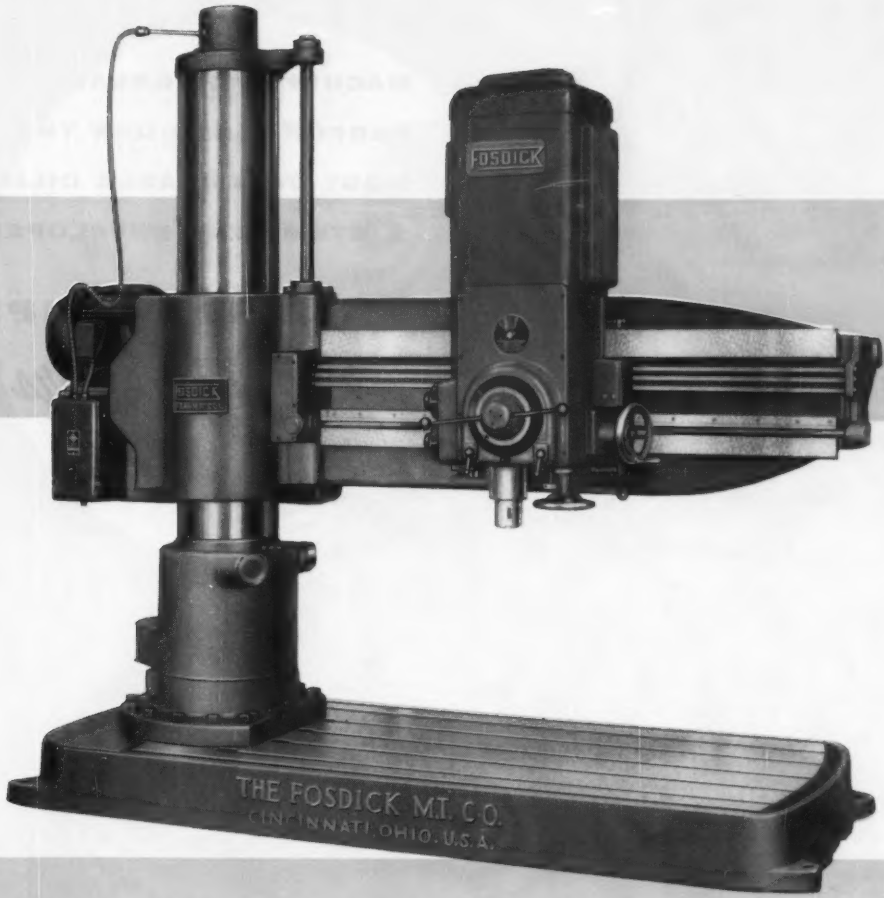


. . . . Drill with

Smooth running, high precision and extra rigidity make the new Fosmatic outstanding among Radial Drills. Case-hardened gears are ground on the finest equipment available. They run on ground splined shafts which are mounted in ball bearings. Lubrication is automatic.

Thirty-six spindle speeds with a maximum of 3000 rpm are available in a variety of ranges, each with a 127.5 to 1 ratio. The new boring-type spindle is of heavy section with bearings placed far apart for extreme rigidity; it can easily be used for boring, milling and the heaviest drilling. A new and unique counterbalance produces equal tension on the spindle whether it is extended or close to the head.

NEED DRILLING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!



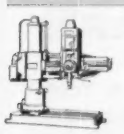
Speed, Ease and Precision

For more efficient tapping, reverse spindle speed is 40% faster than forward speed.

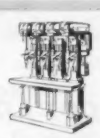
Our new arm is probably the strongest in the business. It has a double boxed section with very heavy walls; ways have been widened considerably. The head is mounted on roller bearings on hardened and ground ways with an additional roller support in back of the arm. Safety nut is hydraulic. Column is superfinished.

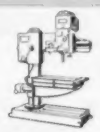
Eighteen feeds are available, including 5 tap leads, from .003" to .125". Feed engagement is through a powerful magnetic clutch which will never require adjustment. The feed dial is graduated to full spindle travel to eliminate resetting for deep holes. Electronic milling feeds are also offered — from ¾ to 15 ipm.

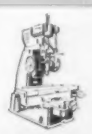
Standard sizes available with 4' to 8' arms, 13" to 19" columns.


Radial Drills

Jig Borers


Sensitive and Upright Drills


Sensitive Radial Drills


Automatic Positioning Machines

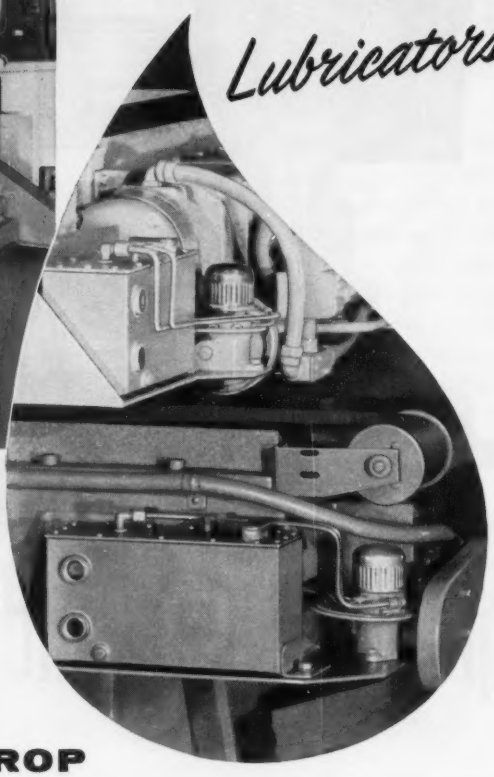
FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

MACHINES OF GREAT PERFORMANCE USE THE MOST DEPENDABLE OILING SYSTEM EVER DEVELOPED

...MADISON-KIPP

Lubricators



Two Madison-Kipp OL Lubricators installed on the world's largest band machine and die filer, manufactured by the DoALL Co., Des Plaines, Illinois...Operated by remote control, they machine 10-ton extrusion dies for the Air Force "Heavy Press Program."

Fresh Oil...

BY THE MEASURED DROP

...from a Madison-Kipp Lubricator is the most dependable method of lubrication ever developed. It is applied as original equipment on America's finest machine tools, work engines and compressors. You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy where oil under pressure fed drop by drop can be installed.

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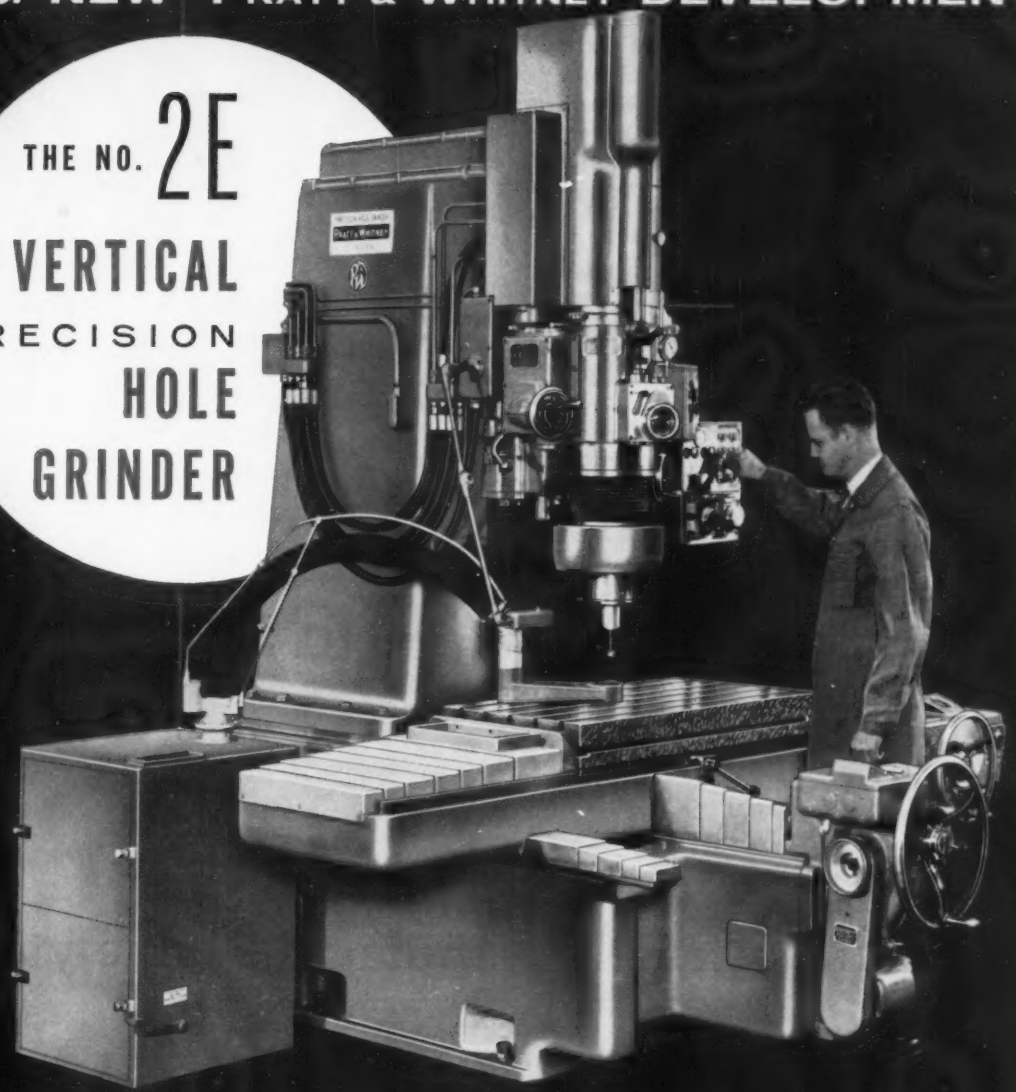
• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

For more information on products advertised, use Inquiry Card, page 243

Another NEW PRATT & WHITNEY DEVELOPMENT

THE NO. 2E VERTICAL PRECISION HOLE GRINDER



- **EXTREMELY ACCURATE** . . . Incorporates the famous P & W Electrolimit Measuring System. Table settings accurate to .0001". Grinds straight or tapered holes and radii with extreme accuracy.
- **HIGH GRINDING SPEEDS** . . . Pneumatic grinding heads, of unique air bearing design, provide speeds from 4,000 to 100,000 rpm. Governor effectively maintains speed settings regardless of load changes.
- **FAST, SIMPLE, ECONOMICAL OPERATION** . . . Unlike conventional bore grinders, the 2E holds work stationary; grinding head has planetary motion around axis of hole. This — combined with fast, accurate table locating system — permits grinding holes of various sizes in a workpiece to close tolerances for size and location in a single setup. Controls for all machine motions within easy reach of operator. Time and costs are minimized.
- **VERSATILE** . . . Grinds holes up to 10" dia. Big table (22" x 44") with P&W open-side construction easily accommodates large or odd-shaped work. By adding a P&W Precision Rotary Table, any simple or compound angle can be located and ground without special fixtures.
- **DURABLE-DEPENDABLE** . . . All slide ways are protected by telescoping guards. Entire machine is designed and built to minimize wear and to retain its original high accuracy and rigidity year after year.

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U.S.A.

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FIRST CHOICE FOR ACCURACY SINCE 1860

MACHINE TOOLS • CUTTING TOOLS • GAGES

milling, drilling, tapping machine yields

93.4% the first 9 months

Avey

Can you afford to ignore an investment that returns 100% in less than a year? It doesn't seem likely, yet many plant operators hold down milling, drilling, and tapping operations to the capacity of standard machines.

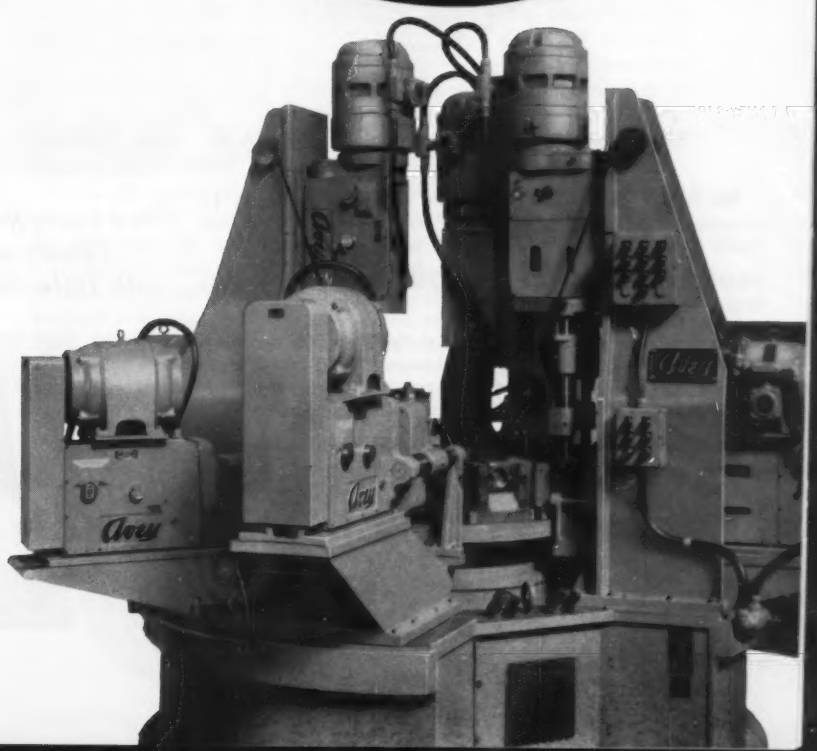
In contrast, the owner of this Avey production machine made high returns on this cast iron pump body (it may be similar to yours): 1 operator instead of 6; floor space cut from 600 to 180 sq. ft.; time per part from 5 minutes to 42 seconds. Put these figures in profit-and-loss terms and you see why the Avey machine pays off so fast.

The machine has 10 Avey No. 2 Cam Feed units, a standard ribbed steel base, and standard automatic index table. Fixtures: rigid cam type. All units and the table are electrically interlocked; J.I.C. control panel. Production: 85 parts/hr. at 100% efficiency. ▶ *This machine has now been re-engineered for a different part*—so economically that even higher gains are expected this year.

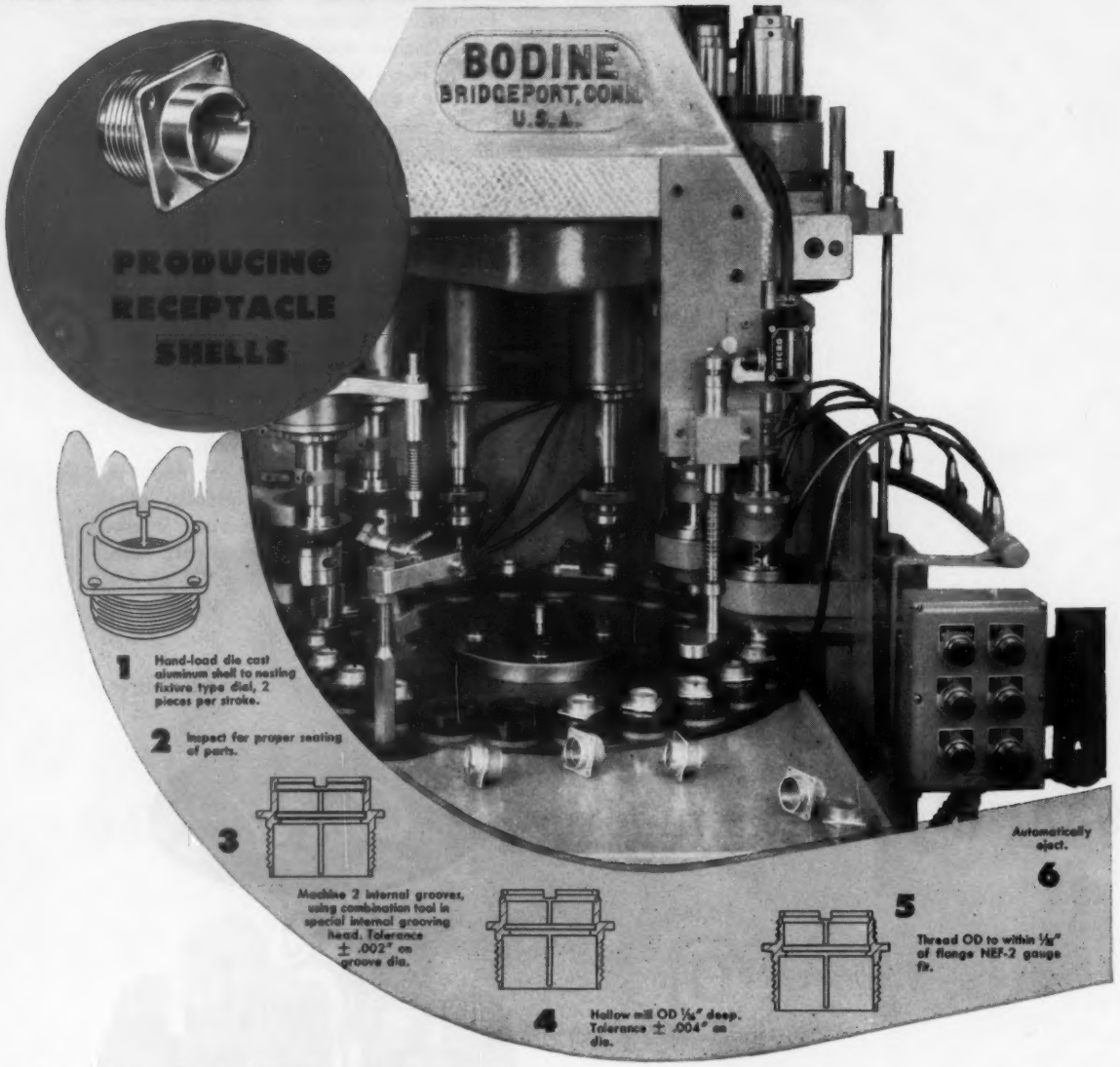
Whatever your cash situation, new tax laws and Avey's pay-as-you-produce plan enable you to make this fast-earning investment now. Send a print of your part, state desired production rate, and ask Avey for a *profit prediction*.◀

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines



Bodine CASE HISTORY NO. 38


PRODUCING RECEPTACLE SHELLS
BODINE
BRIDGEPORT, CONN.
U.S.A.
1 Hand-load die cast aluminum shell to nesting fixture type dial, 2 pieces per stroke.
2 Inspect for proper seating of parts.
3 Machine 2 internal grooves, using combination tool in special internal grooving head. Tolerance ± .002" on groove dia.
4 Hollow mill OD ⅛" deep. Tolerance ± .004" on dia.
5 Thread OD to within ⅛" of flange NEF-2 gauge fit.
6 Automatically eject.

This Bodine Model 48-30 machine is tooled to handle 13 receptacle shells ranging from 7/16-27 to 1⅜-18 NEF 2 threads. Shells are used for multiple terminals in TV, Radar, etc.

PRODUCTION: From 1,600 to 2,200 pieces per 50-minute hour, depending on size of shell.

Potentiometers next to push button station regulate two electronically controlled variable speed motors. Positive, accurate control over spindle rpm and over rate of feed gives lead-screw accuracy to the threads with a non-reversing spindle.

Bodine machines (of four types) may be tooled for an extremely wide variety of high speed repetitive production jobs . . . including drilling, tapping, threading, screw inserting, light milling, and assembly. For a true picture of cost cutting, write Dept. M-10 for our brochure "Bodine Presents 12 Typical Case Histories."

"You Can't Meet Tomorrow's Competition with Yesterday's Machine Tools."

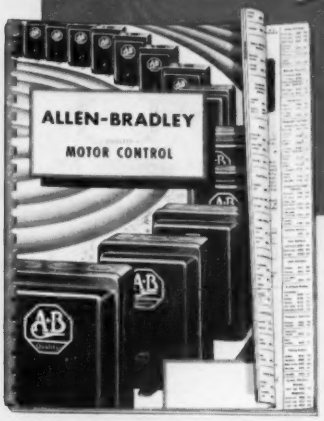
THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

BBD54

An

ALLEN-BRADLEY *Special* CONTROL PANEL...

for which the ALLEN-BRADLEY HANDY CATALOG PROVIDES THE BUILDING BLOCKS



Use this A-B Handy Catalog as a quick-and-easy reference guide in selecting components for trouble-free control panels.

Your special control panels may be simple or they may be complex . . . but their reliable performance can be guaranteed in advance if you use the time-tested, trouble-free components listed in the A-B Handy Catalog, shown above.

In this 120-page Handy Catalog you will find the "building blocks" for any type of control panel. Every unit has a long service record of dependable performance in all kinds of industrial applications. Being "QUALITY" products, they are a sales asset to your machines.

First—there is the simple solenoid design. With only ONE MOVING PART, there are no troublemaking pins, pivots, or bearings to corrode and stick.

Second—the double break, silver alloy contacts do away with contact maintenance. You never have to file or clean the contacts on A-B controls.

Third—the Quality workmanship that goes into A-B controls is obvious at a glance. Use A-B "building blocks" for your special panels or let A-B build such panels for you!

A-B Quality

The Sign of QUALITY Motor Control

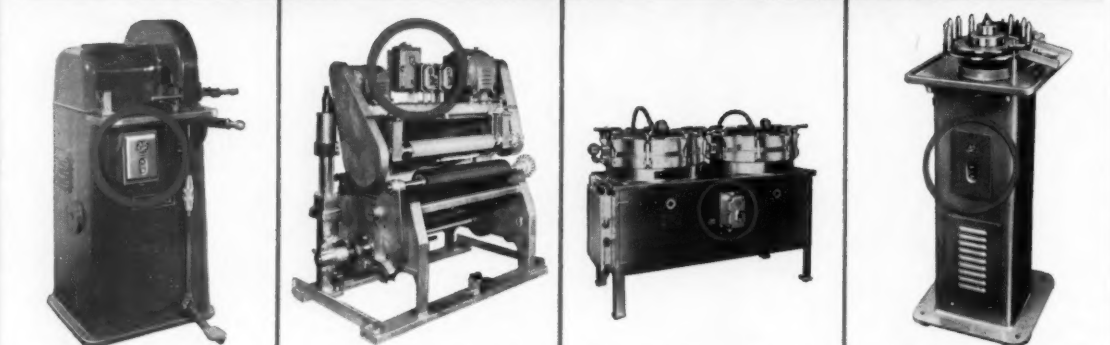
Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

8-55-R

The Quality Line
of Manual Motor Starters

GENERAL PURPOSE	WATERTIGHT	EXPLOSION-PROOF	FLUSH TYPE



A-B manual starter, in NEMA 1 general purpose enclosure, on DeWalt metal cutter.

A-B manual starters, in NEMA 4 watertight enclosures, on Stehling fleshing machine.

A-B manual starter, in NEMA 7 explosion-proof enclosure, on Hilco oil reclaimer.

A-B manual starter, in Type 1B1 flush mounting, on Noble & Westbrook shell marker.

The popularity of Bulletin 609 manual starters rests on the following facts!

1—They are so simple. Few moving parts mean few chances for trouble.

2—Quick-make and quick-break switching action prevents contact "teasing."

3—Double-break, silver alloy contacts need no cleaning or filing—they are always in perfect operating condition.

4—Use of "buttons" for ON and OFF switching is in line with operation of automatic starters and is convenient for machine operator.

5—The two solder-pot overload breakers provide continuously dependable and accurate motor overload protection.

Bulletin 646 autotransformer starter.

Be sure to send for a bulletin describing the full line of A-B Bulletin 609 manual across-the-line starters up to 5 hp, 220 v; 7½ hp, 440-550 v.

8-55-MR

Allen-Bradley Co.
1316 S. Second St.
Milwaukee 4, Wis.

In Canada—
Allen-Bradley Canada Ltd.
Galt, Ont.

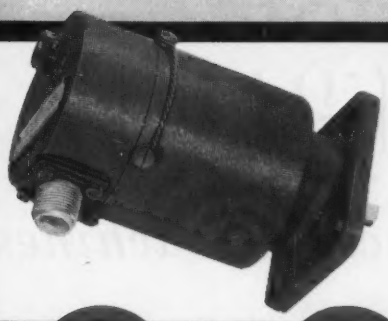
A-B Quality

ALLEN-BRADLEY

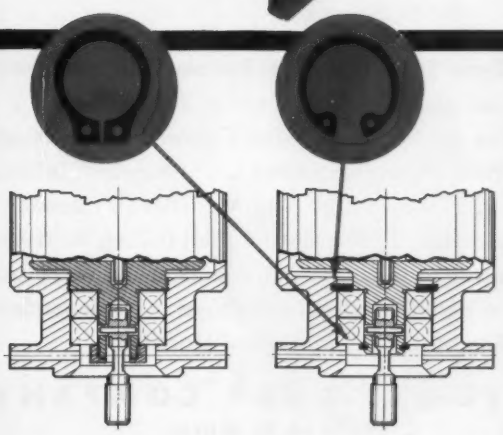
SOLENOID STARTERS

QUALITY

10 Waldes Truarc rings speed assembly— Eliminate parts and machining in precision control

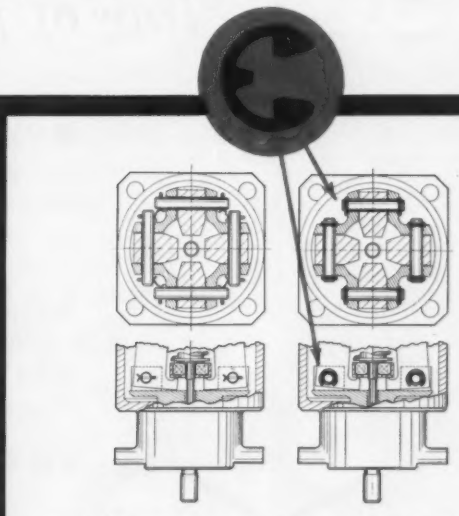


Kahn Rotary Speed Control
Kahn and Company, Inc., of Hartford, Conn., use a total of 10 Waldes Truarc Retaining Rings in this new mechanical-electric translator for automatic control of rotary speed. Truarc rings act as positioners and retainers to eliminate parts, simplify operations, save labor, and speed assembly.



Rotor Installation. In the old way, ball bearing was retained by a threaded shoulder and threaded bearing cup retainer.

New way, using two Truarc Rings (Series 5100 and 5000) eliminates 4 threading operations, bearing shoulder and threaded bearing cup. Assembly is quicker and easier, two ounces lighter.



Flyweight Assembly. Formerly, 2 holes had to be drilled in each of the 4 pivots, and 8 cotter pins were required.

The new way, using 8 Truarc E-Rings (Series 5133), replaces holes with grooves, reduces pivot size, leaves no projecting parts. Rings snap into place, speed assembly time by three minutes per unit.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product... to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

36 functionally different types... as many as 97 different sizes within a type... 5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U. S. A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today... let our Truarc engineers help you solve design, assembly and production problems... without obligation.

For precision internal grooving and undercutting ... Waldes Truarc Grooving Tool!

Send for new catalog supplement

WALDES
TRUARC®
RETAINING RINGS

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
(Please print)

Name.....
Title.....
Company.....
Business Address.....
City..... Zone..... State.....

M107

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787. and other U. S. Patents pending. Equal patent protection established in foreign countries.

for Faster and More Economical

FOOTBURT

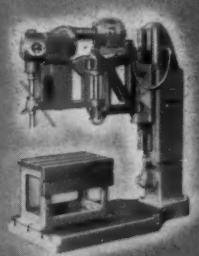
line of production machines

■ Way Type Drilling, Boring, Reaming, Tapping and Milling Machines with One, Two or More Ways . . . Station Type Machines . . . Center Column Type Machines . . . Cylinder Boring Machines . . . Inverted Drilling Machines . . . Surface Broaching Machines . . . Sensitive Drilling Machines . . . Hammond Radial Drilling Machines . . . Hammond Surface Grinding Machines . . . Manufacturing Type High Duty Drilling Machines . . . Independent Feed Drilling Machines . . . Special Machines.

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio
Detroit Office: General Motors Building

1, 2, 3, 4 and 6 Spindle Sensitive Drilling Machines

Extremely Accurate Hammond Tool Room Grinder



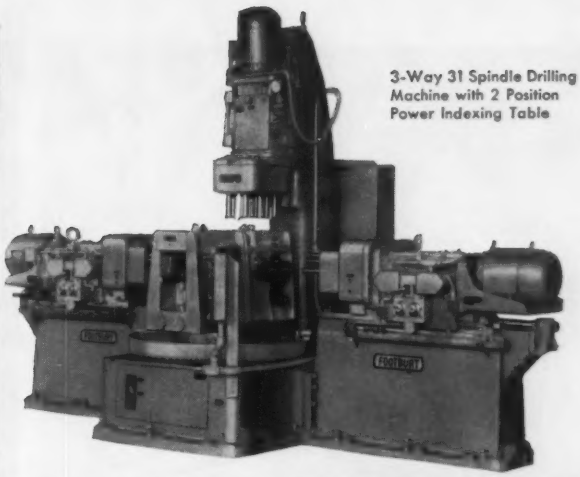
Unique Bracket Type Hammond Radial Drilling and Tapping Machine

Continuous Type Broaching Machine Built in Five Sizes

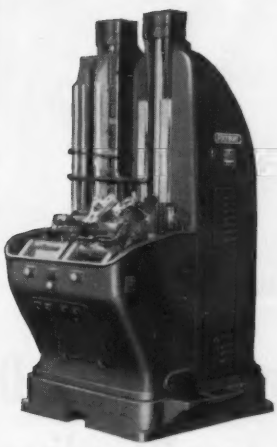
FOOTBURT

MACHINE TOOLS

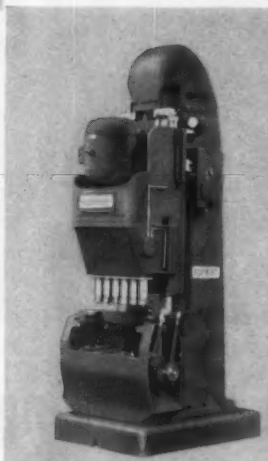
Production...



3-Way 31 Spindle Drilling Machine with 2 Position Power Indexing Table



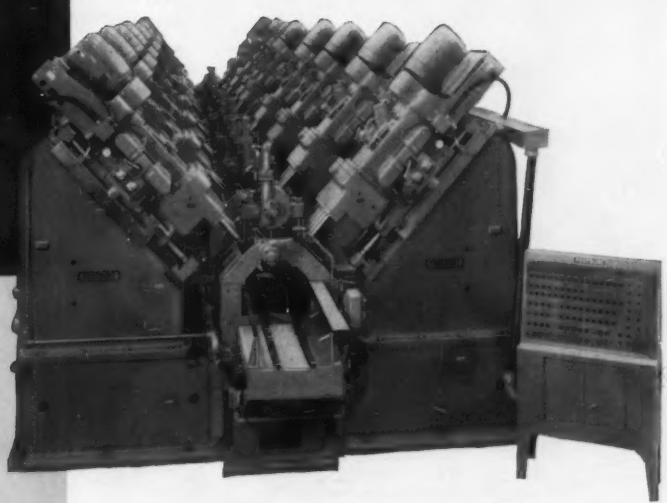
Duplex Surface Broaching Machine 5, 10, 15 and 25 ton capacity



Stub Type Cylinder Boring Machines

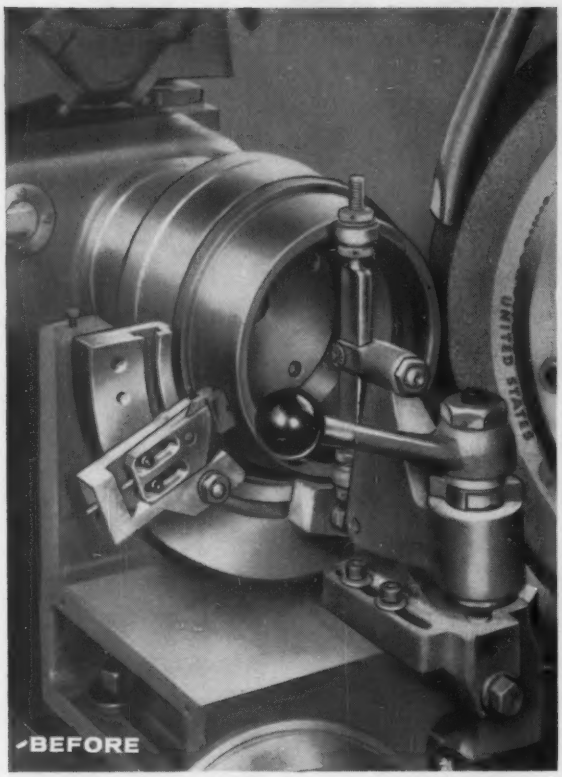
Single Slide Broaching Machine, 5, 10, 15 and 25 Ton capacity

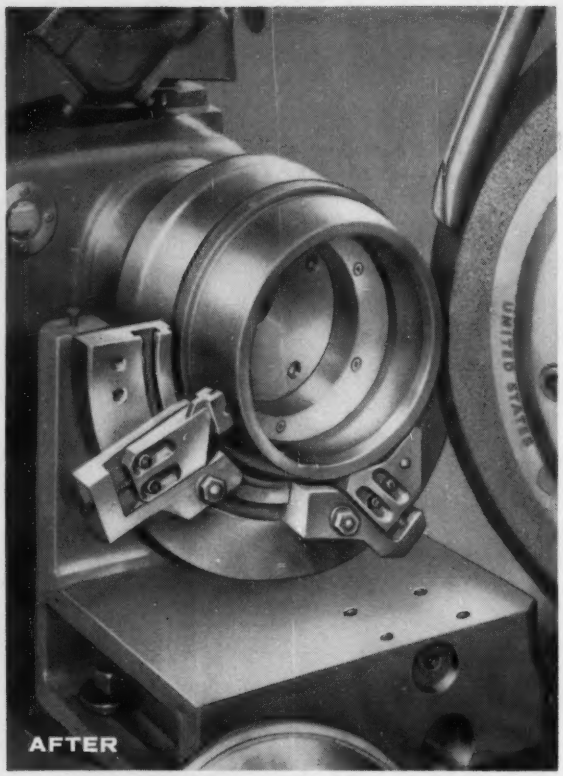
Two-Way Hydraulic Feed Vee Type Stub Boring Machine



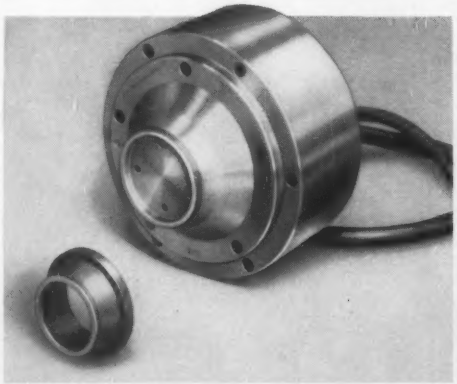
17 Station, 80 Spindle Drilling Machine

engineered for production





New Taft-Peirce Magnetic Work Driver Cuts Shoe Type Centerless Grinding Costs



If you're considering or now doing shoe type centerless grinding, you should look into Taft-Peirce Magnetic Work Drivers. A variation of a rotary magnetic chuck, they hold work magnetically.

Simplifies setups. By eliminating complex tailstock arrangements.

Speeds production. Permits faster automatic or manual loading and unloading.

More versatile. Can be used for greater range of work sizes.

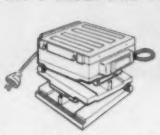
More dependable. There's little can go wrong with its simple, sturdy construction.

What's more, it costs substantially less than present complicated holding devices . . . requires little or no maintenance.

Furnished in either electromagnetic or permanent magnet models . . . designed to suit your requirements. Learn more about this time-and-money-saving work driver. Write today.

PERMANENT MAGNET CHUCKS

RECTANGULAR ELECTRO-MAGNETIC CHUCKS



ADJUSTABLE ELECTRO-MAGNETIC CHUCKS

ROTARY ELECTRO-MAGNETIC CHUCKS

T-P means Top Precision T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

For more information on products advertised, use Inquiry Card, page 243

IN THE AUTOMOTIVE INDUSTRY, IT'S

UNION

UNION DISTRIBUTORS SERVE THE NATION

FOR
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- ECONOMY
- RELIABILITY
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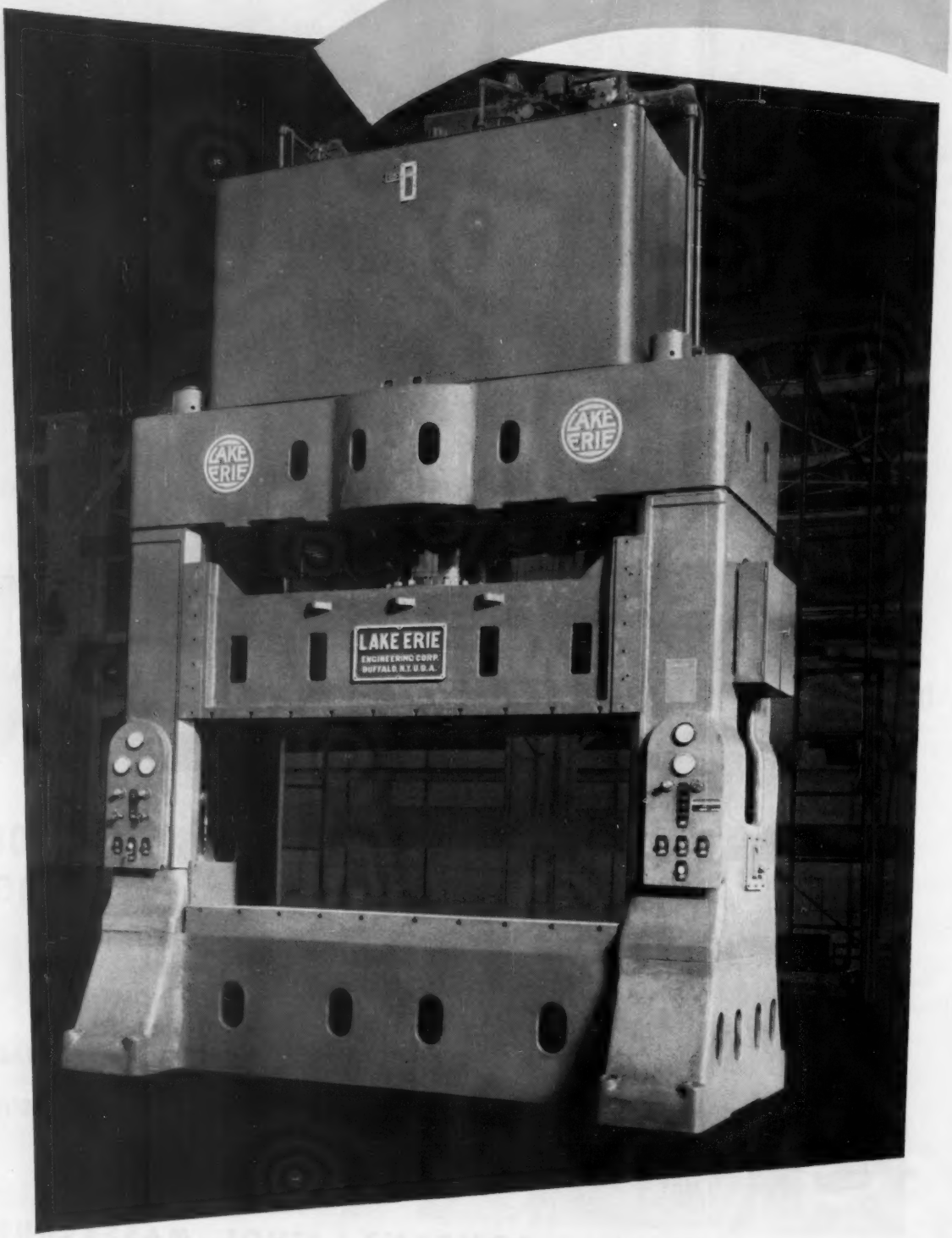
CALL YOUR UNION DISTRIBUTOR

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

DESIGN POLICY IS THE



KEY TO SUPERIOR PRESSES

FORGED STEEL CYLINDERS... *eliminate possible failure of integrally cast cylinders*

HEAVIER SECTIONS... *mean lower stresses.*

LAPPED CYLINDERS AND PISTONS... *insures precision fit.*

QUICK-SET STROKE CONTROLS... *save time on set-ups.*

UNUSUALLY RUGGED SIDE HOUSINGS... *increase frame rigidity.*

FAIL-SAFE DEVICES... *in electric and hydraulic circuits.*

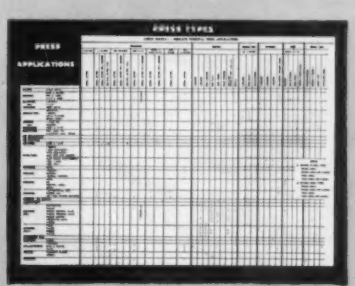
SIMPLIFIED ELECTRICAL SYSTEM... *designed for maximum safety and ease of maintenance.*

BRONZE USED EXTENSIVELY... *bronze throat bushings provide better guiding.*

... *bronze piston heads, gland bushings, and pre-fill valve disc prevent scoring.*

LAKE ERIE BUILDS THEM BETTER... Mechanically, electrically, and hydraulically, Lake Erie presses bring you the greatest number of superior features. That's why Lake Erie press users almost always return to us for additional presses. They know from experience that Lake Erie incorporates many "special" features as "standard"... features which seldom if ever form a part of customer specifications. They know that these features mean longer press life, minimum maintenance, maximum productivity. Next time, call on Lake Erie.

SEND FOR HANDY BUYER'S GUIDE



LAKE ERIE HYDRAULIC PRESSES

EXTRUSION PRESSES • DIE CASTING MACHINES
ROLLING MILL AUXILIARY EQUIPMENT

LAKE ERIE ENGINEERING CORP. *General Offices and Plant: 470 Woodward Ave., Buffalo 17, N. Y.*
District Offices in New York, Chicago, Detroit, Pittsburgh
Representatives in Other U. S. Cities and Foreign Countries

LAKE ERIE®

GRAY

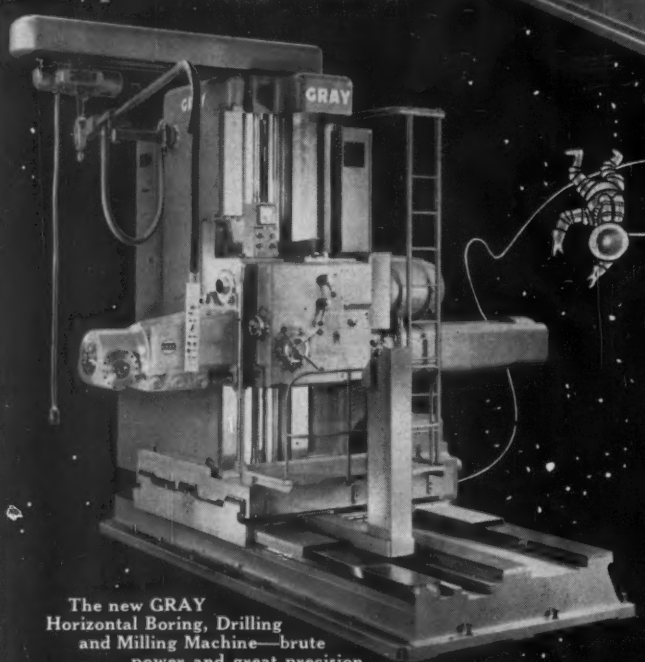
is out of this world

Out-of-this-world thinking has produced down-to-earth features that speed handling, loading, maintenance and, of course, machining. Gray design is aimed at cutting *all* your costs, further proof that

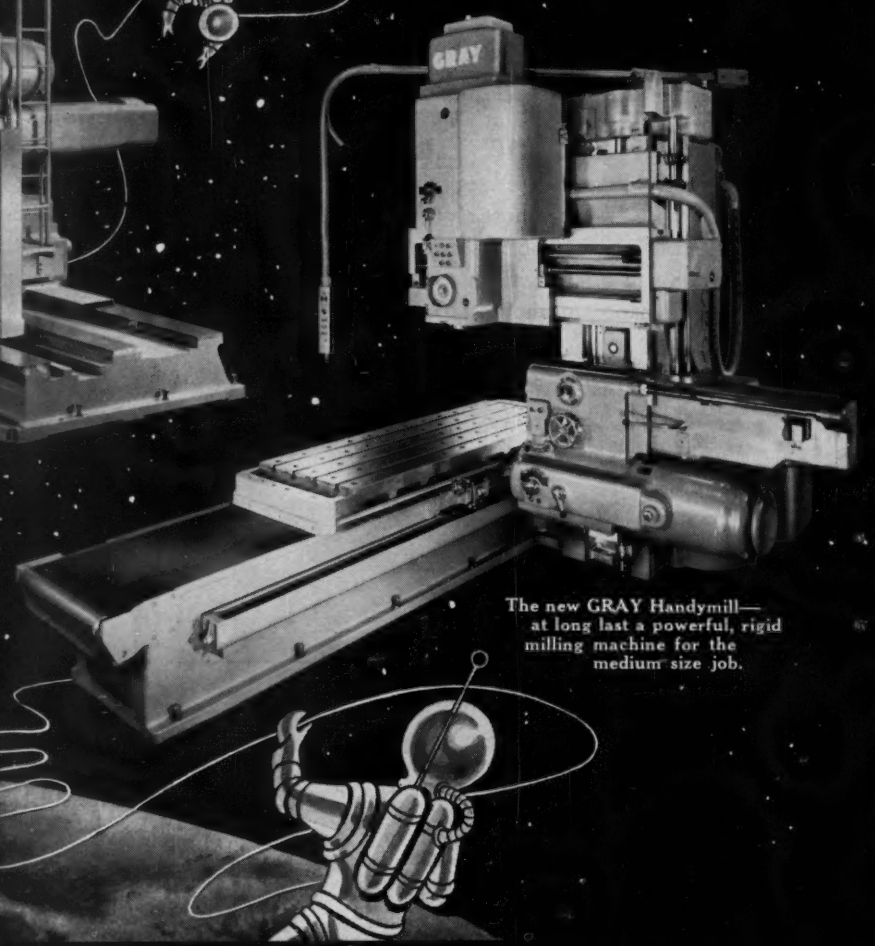
Quality doesn't cost . . . it pays.

The G. A. GRAY CO.
Cincinnati 7, Ohio

The new GRAY Universal Planer—single cuts, double cuts, triple cuts, and cross cuts —a revolutionary concept in high-speed machining.



The new GRAY Horizontal Boring, Drilling and Milling Machine—brute power and great precision with versatility unlimited.



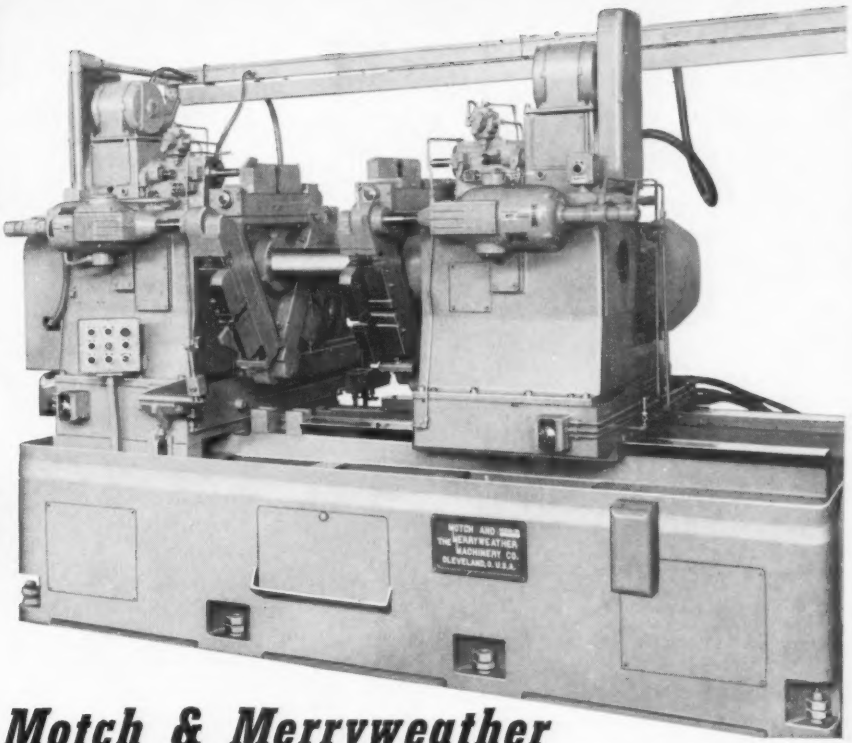
The new GRAY Handymill—at long last a powerful, rigid milling machine for the medium size job.

Heavy Duty

Rigid

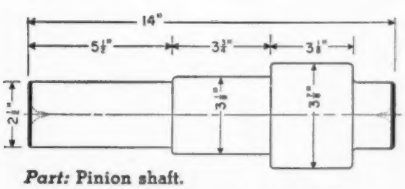
Accurate

Productive



The Motch & Merryweather
No. 3-MCT Milling and Centering Machine
FOR UNIVERSAL PRODUCTION

Adopt this Active Asset to Automation



Part: Pinion shaft.
Operation: Mill and center drill both ends.
Production: 220 pieces per hour.

Mass production, yet with extreme accuracy, — that is the central requirement for preparing parts which go to your automatic equipment. Begin automation *right* by preparing your parts *right* on the Motch & Merryweather 3-MCT Milling and Centering Machine. This universal heavy duty unit excels for high single-purpose production, while quick set-up makes short runs profitable. Automatic loading and unloading may be incorporated to handle extremely high production. The 3-MCT performs with a dispatch and precision hitherto unknown.

THE MOTCH & MERRYWEATHER MACHINERY CO.

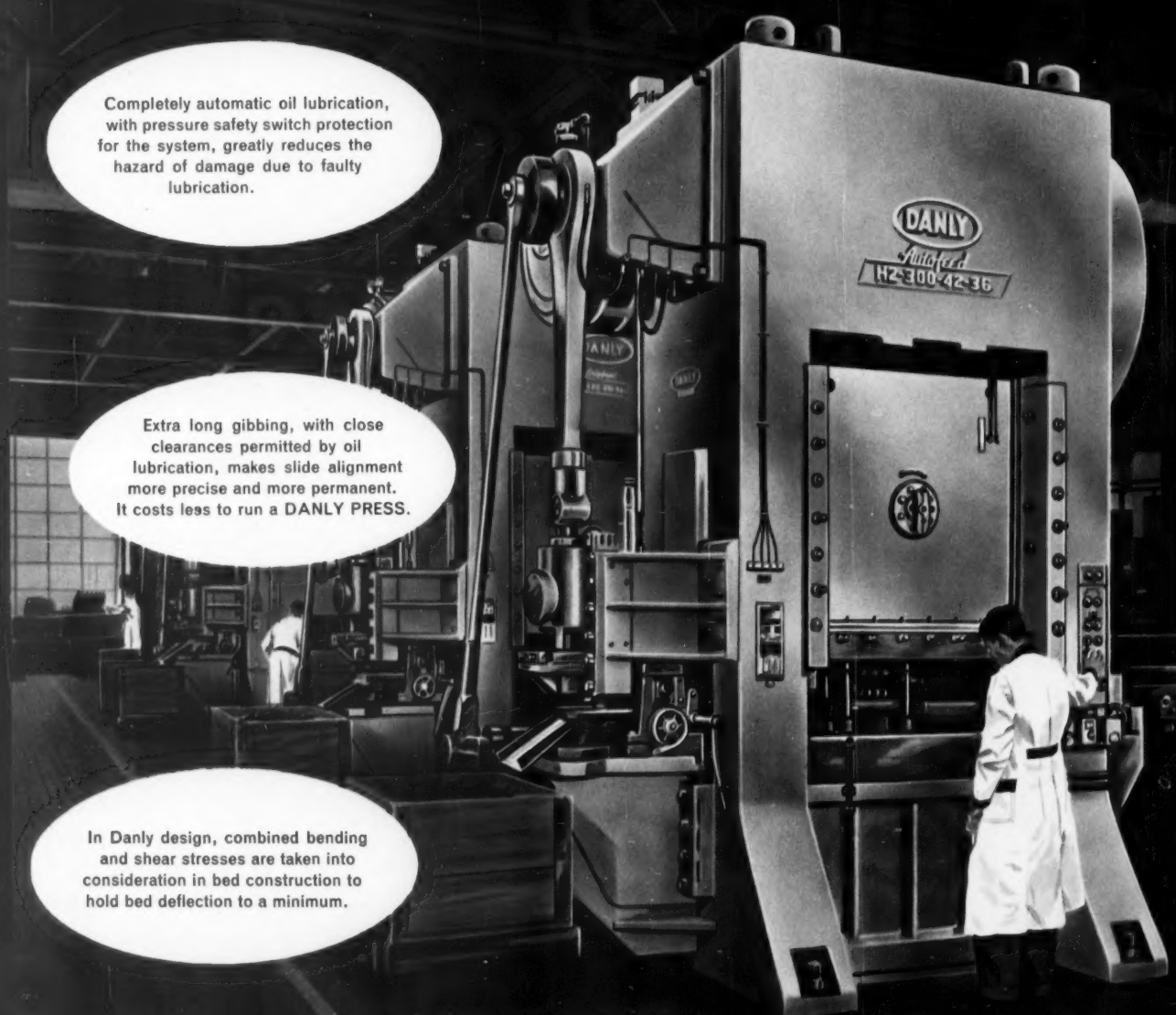
MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders also of Production Milling, Vertical Turning, Automatic and Special Machines

comparison proves

DANLY AUTOFEED PRESSES MAKE HIGH PRODUCTION DIES LAST LONGER



Completely automatic oil lubrication, with pressure safety switch protection for the system, greatly reduces the hazard of damage due to faulty lubrication.

Extra long gibbing, with close clearances permitted by oil lubrication, makes slide alignment more precise and more permanent. It costs less to run a DANLY PRESS.

In Danly design, combined bending and shear stresses are taken into consideration in bed construction to hold bed deflection to a minimum.

USE THIS CHECK LIST

...Compare Danly Presses, feature for feature, with any other press on the market.

COMPARE	FEATURE	DANLY	OTHER
INSTALLATION COSTS	Danly presses are delivered already "run-in" tested. Faster installation is assured by assembly and operation in the Danly plant.	✓	
DRIVE	Danly's cool-running clutch lasts up to 7 times longer. Herringbone type gears and anti-friction bearings on high speed shafts wear longer.	✓	
CONSTRUCTION	Danly presses are made entirely of heavy stress-relieved steel weldments. Extra heavy internal ribbing decreases deflection.	✓	
LUBRICATION	Danly features completely automatic oil lubrication. When any vital area is not being sufficiently lubricated, safety switch stops press.	✓	
MAINTENANCE	Performance records in the country's biggest stamping shops prove that Danly Presses require less maintenance, greatly reduce spare part needs.	✓	
CONTROLS	Special Danly Control arrangements make operation easier and safer, minimize accidental damage, facilitate automation—can be completely enclosed.	✓	

. . . that's the report received from one of the world's leading manufacturers of conveyor systems and materials handling equipment. Their comparison of Danly press features against all others, led them to install Danly Autofeed Presses in critical production lines.

Today, after more than six years of high speed production, these Danly presses have required *no major maintenance*. Set-up men prefer the Danlys too, for their *accuracy* of *slide alignment*. Die-setting is easier and faster. Precision dies are better protected against wear, last longer because *vibration and deflection are greatly reduced*. Exacting piece part tolerances of plus or minus .001 are maintained through continuous production runs. This is in spite of the heavy tonnage requirements of off-center coining, piercing and blanking through three stage dies.

Danly presses can provide you with the same amazing economy and dependability of operation. Use the check list in this advertisement . . . make your own point-by-point comparison and see why Danly presses will give increased production at lower cost.

It costs less to run a DANLY PRESS

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

DANLY®

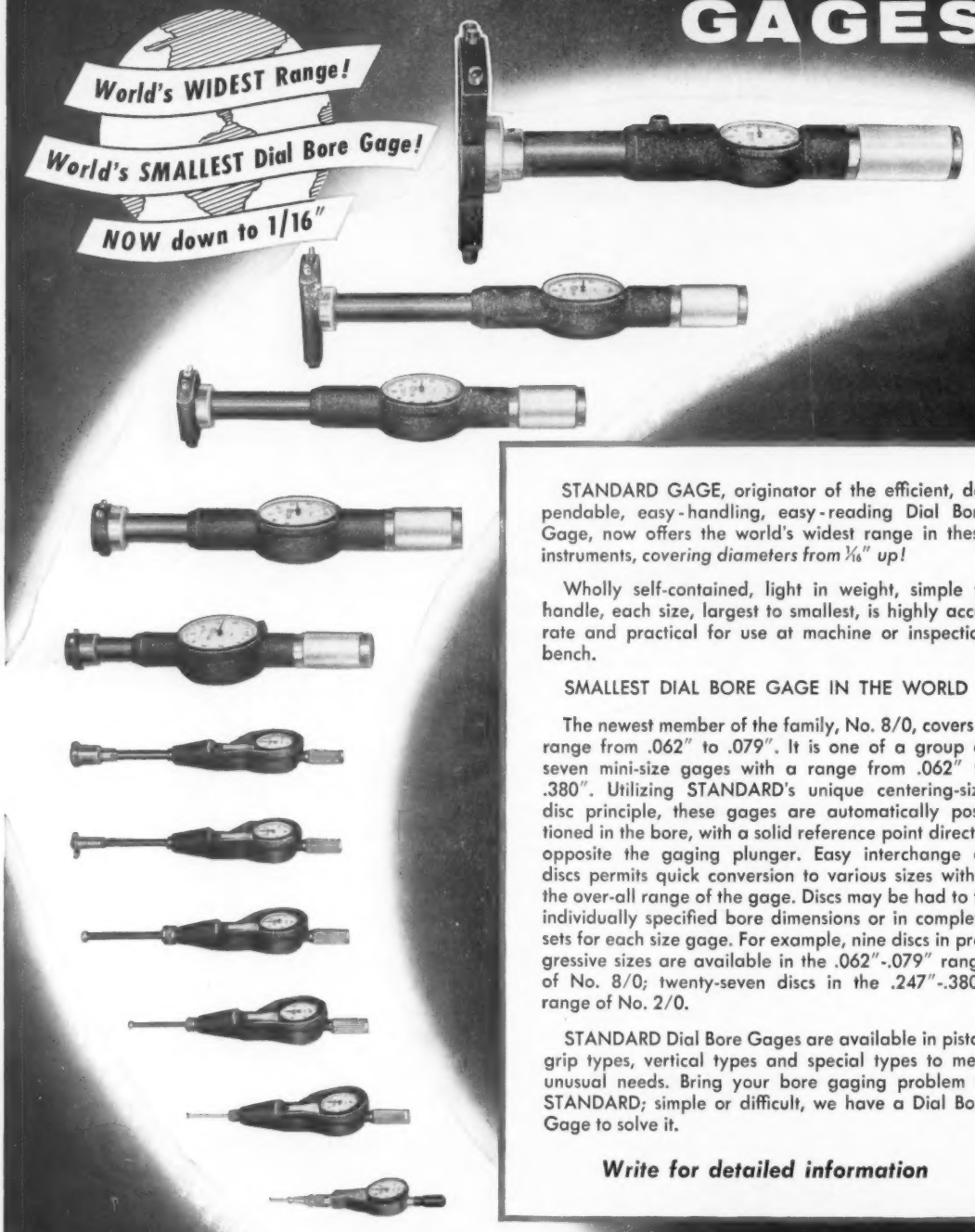
STANDARD®

Dial Bore GAGES

World's WIDEST Range!

World's SMALLEST Dial Bore Gage!

NOW down to 1/16"



STANDARD GAGE, originator of the efficient, dependable, easy-handling, easy-reading Dial Bore Gage, now offers the world's widest range in these instruments, *covering diameters from 1/16" up!*

Wholly self-contained, light in weight, simple to handle, each size, largest to smallest, is highly accurate and practical for use at machine or inspection bench.

SMALLEST DIAL BORE GAGE IN THE WORLD

The newest member of the family, No. 8/0, covers a range from .062" to .079". It is one of a group of seven mini-size gages with a range from .062" to .380". Utilizing STANDARD's unique centering-size disc principle, these gages are automatically positioned in the bore, with a solid reference point directly opposite the gaging plunger. Easy interchange of discs permits quick conversion to various sizes within the over-all range of the gage. Discs may be had to fit individually specified bore dimensions or in complete sets for each size gage. For example, nine discs in progressive sizes are available in the .062"-.079" range of No. 8/0; twenty-seven discs in the .247"-.380" range of No. 2/0.

STANDARD Dial Bore Gages are available in pistol-grip types, vertical types and special types to meet unusual needs. Bring your bore gaging problem to STANDARD; simple or difficult, we have a Dial Bore Gage to solve it.

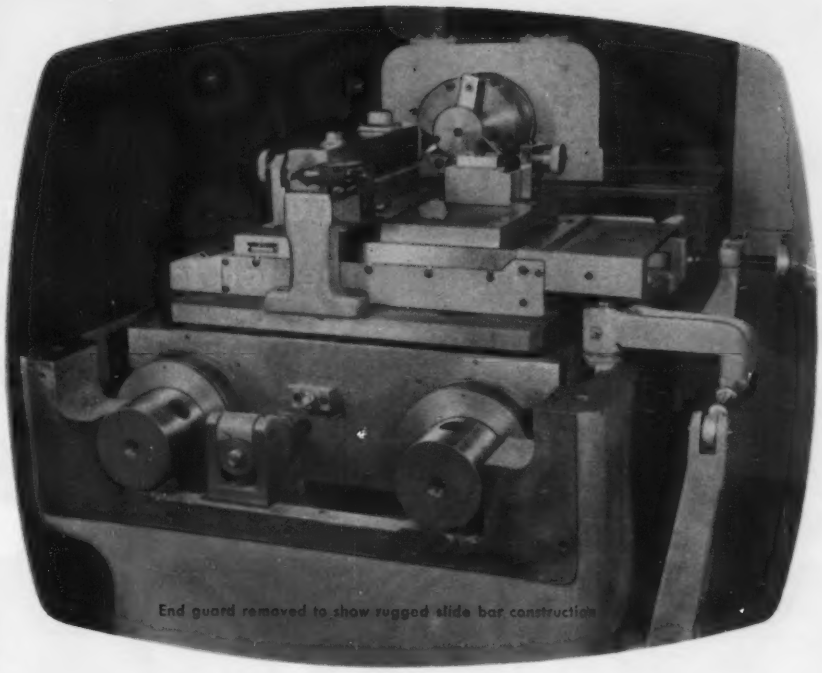
Write for detailed information

STANDARD GAGE COMPANY, INC.

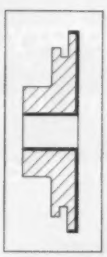
32 PARKER AVENUE • POUGHKEEPSIE, N. Y.

For more information on products advertised, use Inquiry Card, page 243

Get versatility like this...



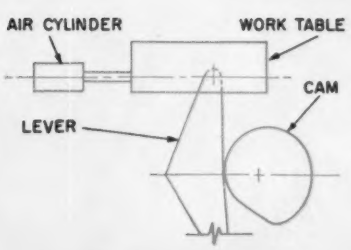
...on the BRYANT 998 precision boring machine!



Part—Gear blank, 1045 steel, 18 to 20 Rockwell "C"
Operation—Bore .4955 +.0005, 1 3/16" long
Turn 3.000 −.002, 1/8" long
Finish face
Stock removal—.007 to .010
Cutting speed—1250 R.P.M., 800 S.F.M.
Feed—5 I.P.M. on diameters, 3¼" to 7¾" on face
Lead—.004 on diameters, .003 to .007 on face
Finish required—40 to 60 micro-inches
Production—74 pieces per hour at 100%

Tooled to do five different gear blanks, the Bryant 998 shown above, bores, turns, and faces short run lots economically and with highest repetitive accuracy.

A wide range of operations—precision boring, drilling, turning, facing—plus contour turning and boring can be done at peak production rates on the Bryant 998.



The Bryant 998 is designed to allow rapid interchange of fixtures and tooling for machining a wide variety of parts. Its table is actuated mechanically by a precision cam and lever unit—providing positive control of the cycle at all times. This feature also eliminates variation due to temperature change of a hydraulic system.

The table's smooth, uniform motion assures fine finishes. The table moves on two 4"-diameter solid steel slide bars firmly bolted to the bed and is supported by two anti-friction pre-loaded ball bearings on each of the bars. This construction provides a metal-to-metal contact which eliminates shifting due to oil film. *Write for Bryant 998 Job Folder.*

BRYANT

chucking grinder co.

SPRINGFIELD 20, VERMONT, U.S.A.

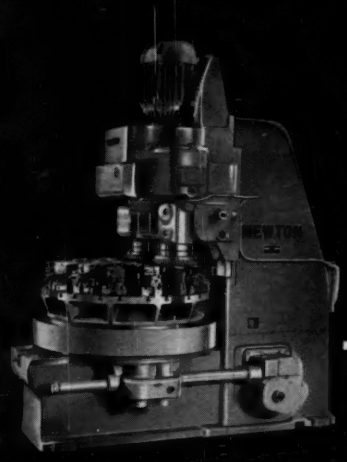
Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

The story of the fastest known method for milling the flat surfaces of repetitive pieces...

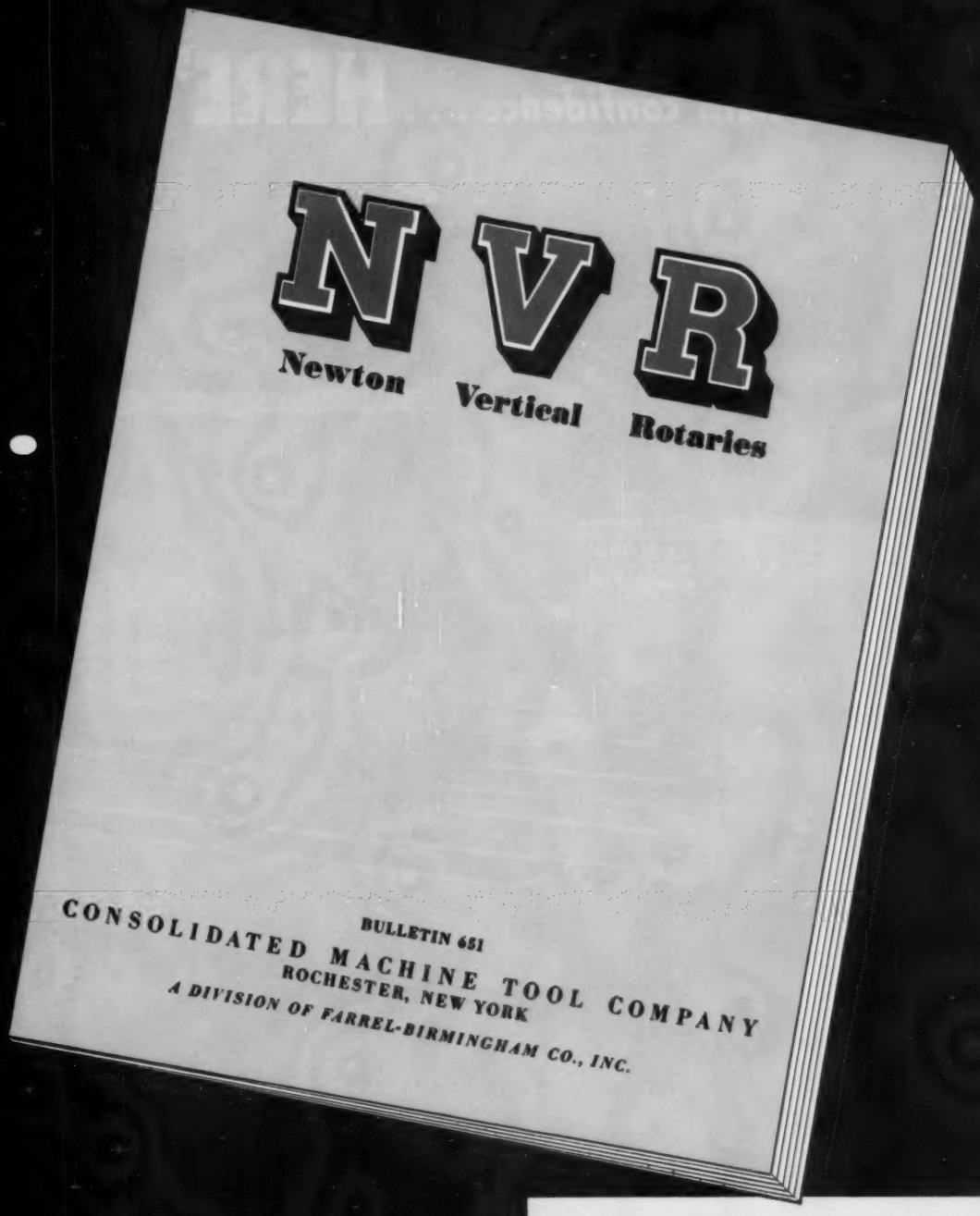
Here's the story..

40 interesting and informative pages on Newton Vertical Rotary Milling Machines that can lead to important savings even on short runs.



CONSOLIDATED MACHINE TOOL

A DIVISION OF FARREL-BIRMINGHAM CO., INC.



COMPANY ROCHESTER 10, N. Y.

CONSOLIDATED MACHINE TOOL COMPANY
565 Blossom Road, Rochester 10, N. Y. M-105

Please send me without obligation your new Bulletin 651 giving the full story on Newton Vertical Rotary Milling Machines.

Name.....

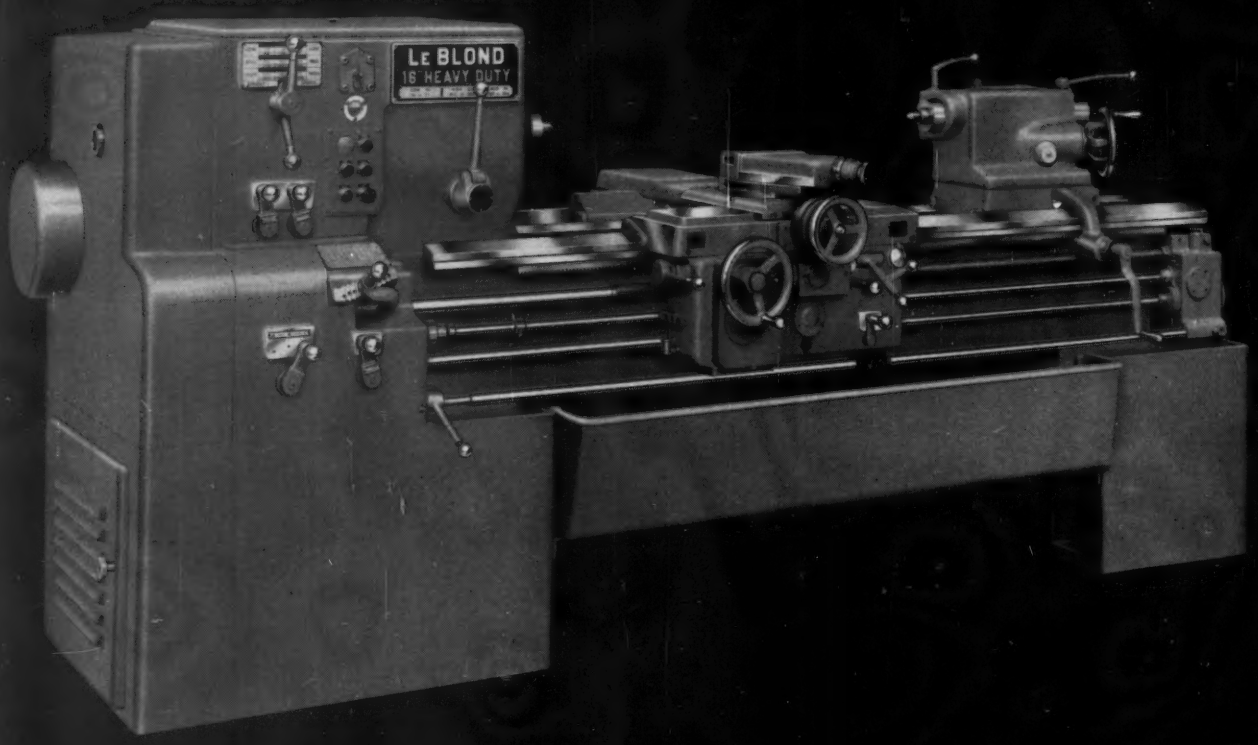
Title.....

Firm Name.....

Address.....

City..... Zone..... State.....

cut with confidence . . . **HERE'S THE**



New LeBlond 16" H.D. Heavy-Duty Lathe

NEW LeBLOND

16" HEAVY DUTY

stamina plus with precision

LeBlond heavy-duty engine lathes have always been known for their outstanding stamina—the inherent ability to stand up to the toughest turning jobs with precision, year after year. Our new 16" Heavy Duty is the most rugged, yet precise machine of its class that we've ever built!

The new headstock uses our proven combination gear-belt drive to give you a complete range of 27 spindle speeds from 16 to 2000 rpm chosen by direct-reading color plate. You get maximum power and smoothness from the 20-hp motor whether you're roughing or finishing—18 speeds are gear driven; 9 higher speeds are driven through a positive Gilmer-type belt that requires no adjustment. Free-running spur gear design assures minimum no-load friction horsepower . . . shafts and gears not needed for a given speed remain idle, do not consume power uselessly.

For a new degree of speed and convenience, a single lever controls the four-way power rapid traverse built into the apron. Both length and cross feed through a positive-jaw clutch are controlled by a single lever. Lubrication is entirely automatic. Bedways are hardened and ground steel inserts fitted to LeBlond's compensating veeway principle for better distribution of cutting forces. Quick-change box is totally enclosed. New tailstock uses the exclusive LeBlond thrust-lock design with a quick-set length dial.

For consistent and precise production, you can't do better than the new LeBlond 16" Heavy Duty. Call your nearby LeBlond Distributor or write for Bulletin HD-126D.

. . . cut with confidence

THE R. K. LEBLOND MACHINE TOOL COMPANY
CINCINNATI 8, OHIO

LeBLOND *of Cincinnati*

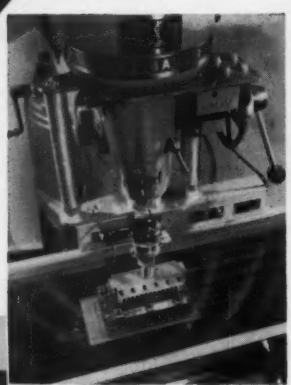
WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 68 YEARS*

Electrical Discharge Machining produced this multiple cavity in 8 hours

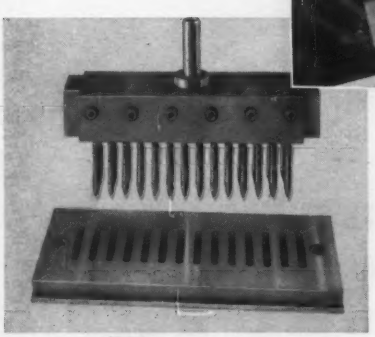
conventional machining time 40 hours

This Elox equipped Vertical Mill
- GRINDS
- DIE SINKS
- ROUTS
- MACHINES MULTIPLE CAVITIES

with unparalleled efficiency and savings



Multiple Cavity in coolant retainer tank of Vertical Mill. Machined automatically without operator attention or broach cost.



Finished die and brass electrode. Die Material: Hi Chrome Die Steel. Tolerances: +.0005"—.000 Finish: 15-20 micro inch.

Our engineering staff is always ready to help solve your specific machining problems. Representatives in your area will arrange appointments, at your request, for grinding, die sinking and cavity forming operations at EDM Demonstration Centers.

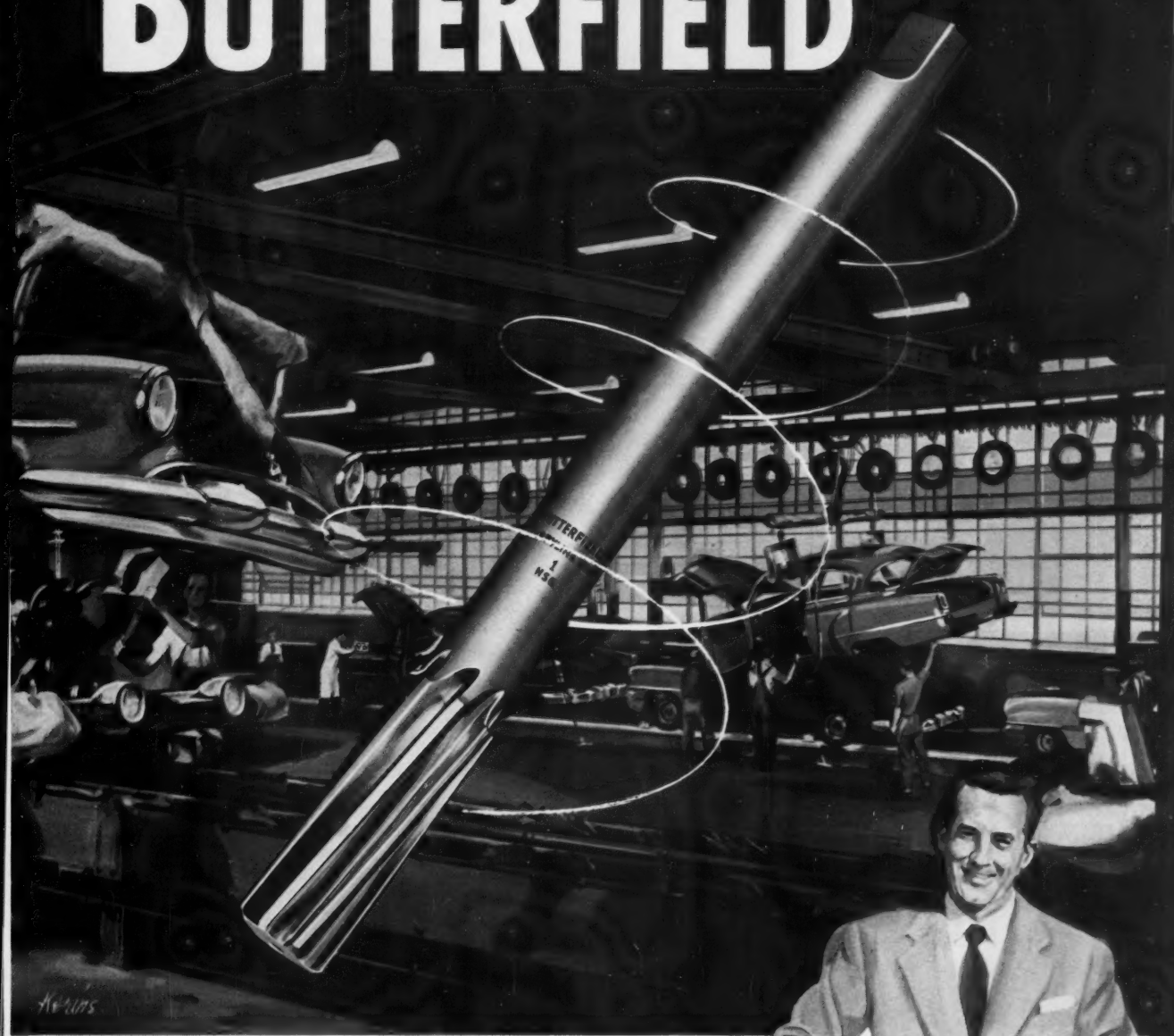
elox* corporation of michigan

742 N. ROCHESTER RD. • CLAWSON, MICHIGAN

DEMONSTRATION CENTERS:
Plant—Clawson, Mich.
45 Broad Ave., Palisades Park, N.J.
1907 W. Monterey, Chicago, Ill. *T.M.Reg

For more information on products advertised, use Inquiry Card, page 243

BUTTERFIELD



A COMPLETE LINE OF QUALITY cutting tools is now available from your Butterfield distributor. Reamers are made to the same exacting standards as Butterfield Taps, Dies, Milling Cutters, Drills, Counterbores and End Mills.

FOR FAST, ECONOMICAL SERVICE
CALL YOUR **BUTTERFIELD** DISTRIBUTOR

UNION TWIST DRILL COMPANY
BUTTERFIELD DIVISION
DERBY LINE, VERMONT, U. S. A.

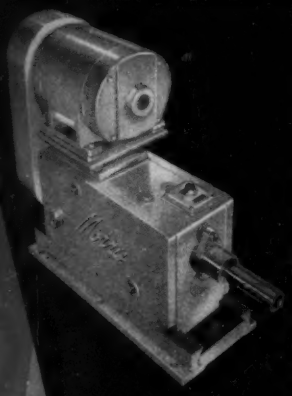
MORRIS AIR-OIL-MATIC DRILL UNITS

Fast, low-cost production for drilling and allied operations.

- Adjustable Feed
- Wide range of spindle speeds
- Convenient controls
- Hydraulically controlled

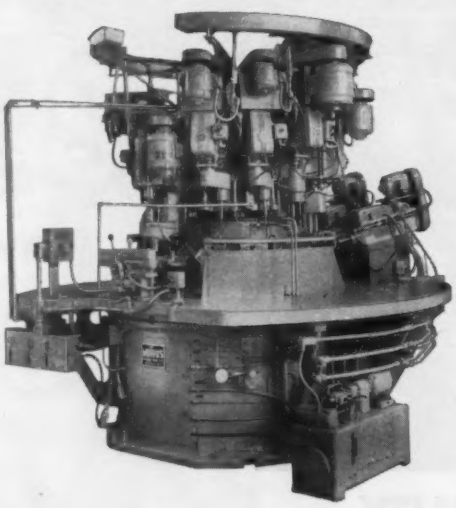
Available for use on Special Purpose Machines like the MORRIS High Production Machines illustrated.

MORRIS CAM-MATIC DRILL UNITS



Newly introduced, MORRIS CAM-MATIC Drill Units provide automatic, electrically controlled, mechanically driven drilling, tapping and allied operations . . with built-in accuracy, dependability and convenience. Specially-featured electric clutch provides automatic thrust control and dull or broken drill detection.

Morris MOR-SPEED

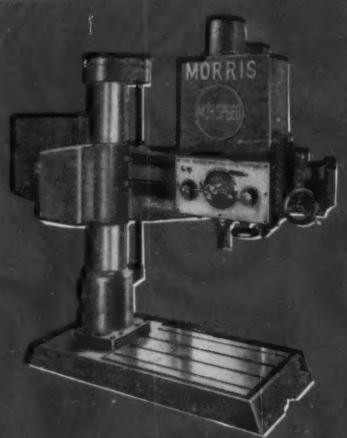


MORRIS HIGH PRODUCTION MACHINES

Special Operations with STANDARD Units

- Specialized Production
- Automatic Indexing and Positioning
- Multiple Operations
- Easy Model Changeover

You can have swift, accurate production on multiple operations like drilling, reaming and tapping with MORRIS Mor-Speed High Production Machines. They provide special operations using standard units, with completely automatic operation. Easy re-alignment speeds model changeovers.

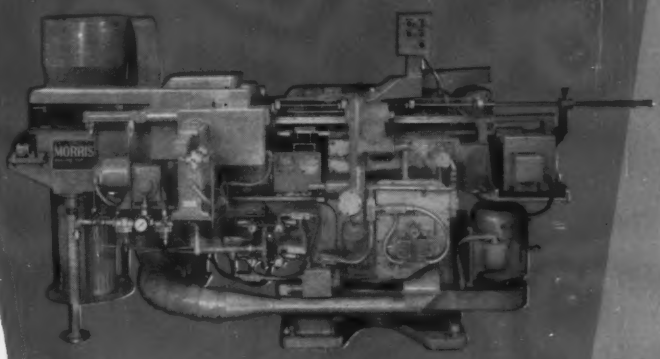


MORRIS MOR-SPEED RADIAL DRILLS

4 SIZES - 2 NEW UNITS
Centralized Controls

A complete line of heavy and light production radial drills feature centralized controls for ease of operation, fast production. Two new models utilize hydraulic control for push-button operation and pre-selected feeds and speeds . . . the easiest, fastest operation ever available.

MORRIS AUTOMATIC BALANCING MACHINES



all new

COMPLETELY AUTOMATIC from load to unload, these machines produce up to 720 perfectly balanced pistons every hour. Units are balanced within one gram plus or minus for extreme accuracy required in finished product.

MACHINE TOOLS

Designed for Production PLUS Precision

N E W . . . with proven performance, that's the story of these up-to-the-minute models of MORRIS Machine Tools. For more than 40 years, MORRIS has designed and manufactured high speed, precision equipment. The new models displayed on these two pages are the latest in a series of machine tools that have won the favor of the nation's leading manufacturers.

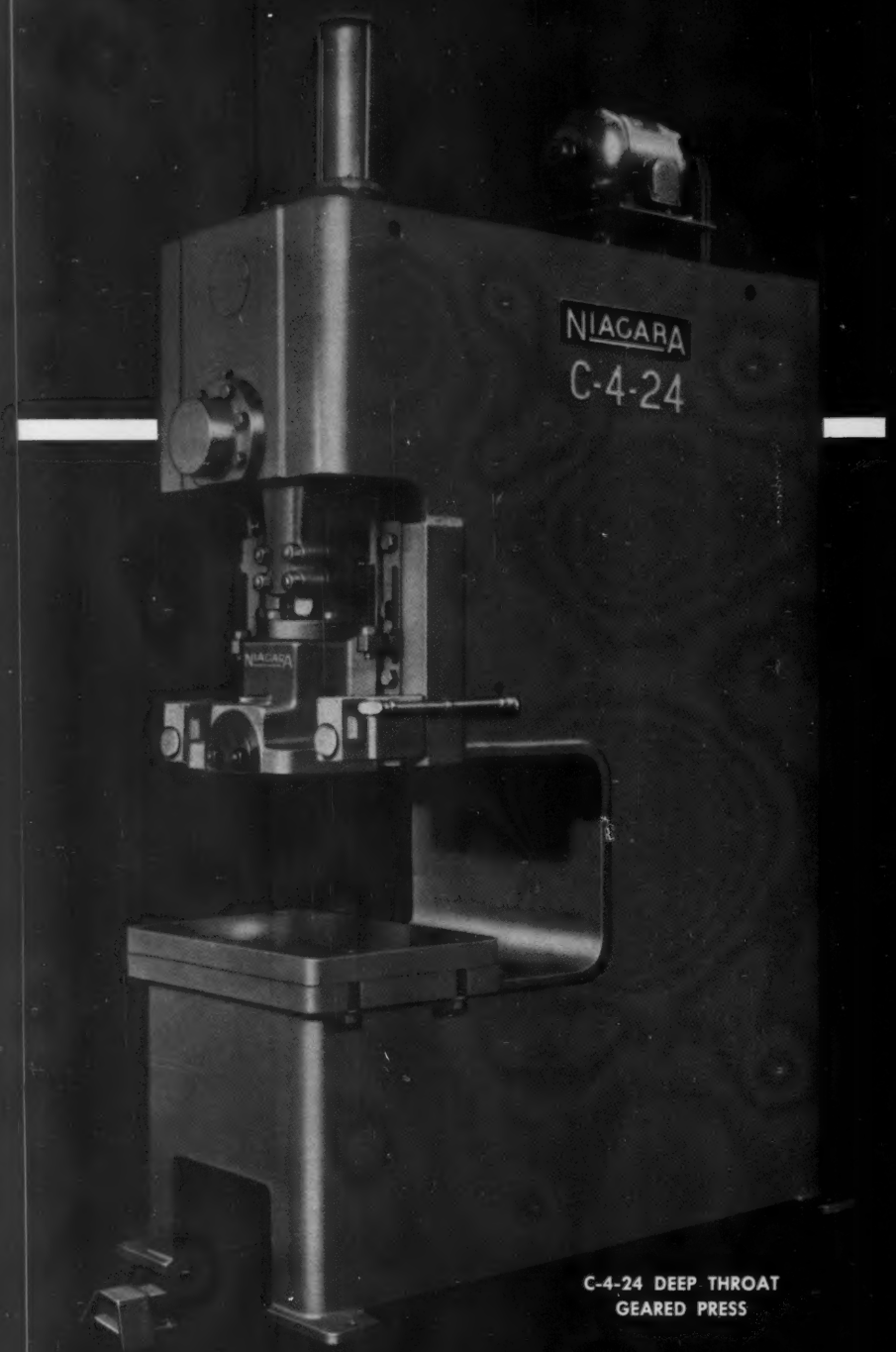
Your built-in benefit with these new MORRIS Mor-Speed Machine Tools is precise work at high speeds. Make your own comparison of MORRIS features with those of any unit. You'll see why the leaders demand MORRIS!

MORRIS MOR-SPEED MACHINE TOOLS have been selected by the world's leading manufacturers for low-cost mass production of precision-made parts and assemblies. Complete case history data is available FREE upon request.

Write today for catalogs concerning specific machines. If you prefer, outline your production problem. MORRIS engineers will make recommendations for its best solution.

Morris

THE MORRIS MACHINE TOOL COMPANY
946 HARRIET STREET, CINCINNATI 3, OHIO, U. S. A.



C-4-24 DEEP THROAT
GEARED PRESS

Air counterbalance offsets weight of slide, die and connections.

No overhanging motor, belts, flywheel, brake, shafts nor other mechanisms.

Front-to-back crankshaft (heavy, forged, high carbon steel) enables fully stylelined, enclosed construction.

Multiple V-Gibs assure maximum die life.

Unusually long slide and stiff channel section eliminate deflection of guiding ways, increasing die life. (J.I.C. flanged slides available.)

Large range of throat depths accommodates tremendous variety of work.

Rugged, all-steel, box type frames stress relieved in a furnace and grit blasted before machining.

Foot switch optionally available for clutch control.

Readily equipped with pneumatic die cushions for drawing operations.

Exclusive electro-pneumatic clutch on all geared models. Famous mechanical sleeve clutch on all plain, non-geared models.

STYLELINE DEEP THROAT PRESSES

NEW

FRONT-TO-BACK CRANKSHAFT DESIGN

embraces numerous operating and structural improvements

Of far reaching importance, the development of Niagara's impressive, new Styleline Deep Throat Presses has opened the way to numerous operating and structural advantages. Barriers imposed by conventional side-to-side crankshaft arrangements and outmoded end wheel designs have been shattered. The Niagara-developed front-to-back crankshaft design introduces a new concept of deep throat press performance and economics:

MODERN, SPACE-SAVING, ENCLOSED CONSTRUCTION

The entire driving mechanism is within the limits of a compact, all-steel frame. There are no exposed, overhanging parts and mechanisms to obstruct crane service, block light, throw grease and consume floor space unnecessarily.

LONGER DIE LIFE, GREATER ACCURACY

Increased distance between gibs makes possible a wider slide (left to right) for greater support to wide dies. Longer gibs assure accuracy for the full stroke.

MINIMIZED SHAFT DEFLECTION AND GEAR WEAR

With all gears located inside the press frame and overhung bearings eliminated, damaging shaft deflection is held to a new minimum. Both pinion and gear are more rigidly supported to withstand maximum loading with minimum wear.

PROLONGED GEAR AND CLUTCH LIFE

Gears and clutch members, all neatly housed in the crown, operate in sealed baths of oil to assure longer service life.

Built in a large range of sizes and throat depths, these modern, Styleline Series C Presses reflect the latest thinking of Niagara engineers . . . today as always, pace-setters in power press advancement.

HERE'S THE WHOLE STORY ON WHAT THESE MACHINES CAN DO FOR YOU

Get all of the facts. Check the specs! Write for new, illustrated Bulletin 61 today. It will be mailed promptly without obligation.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES:

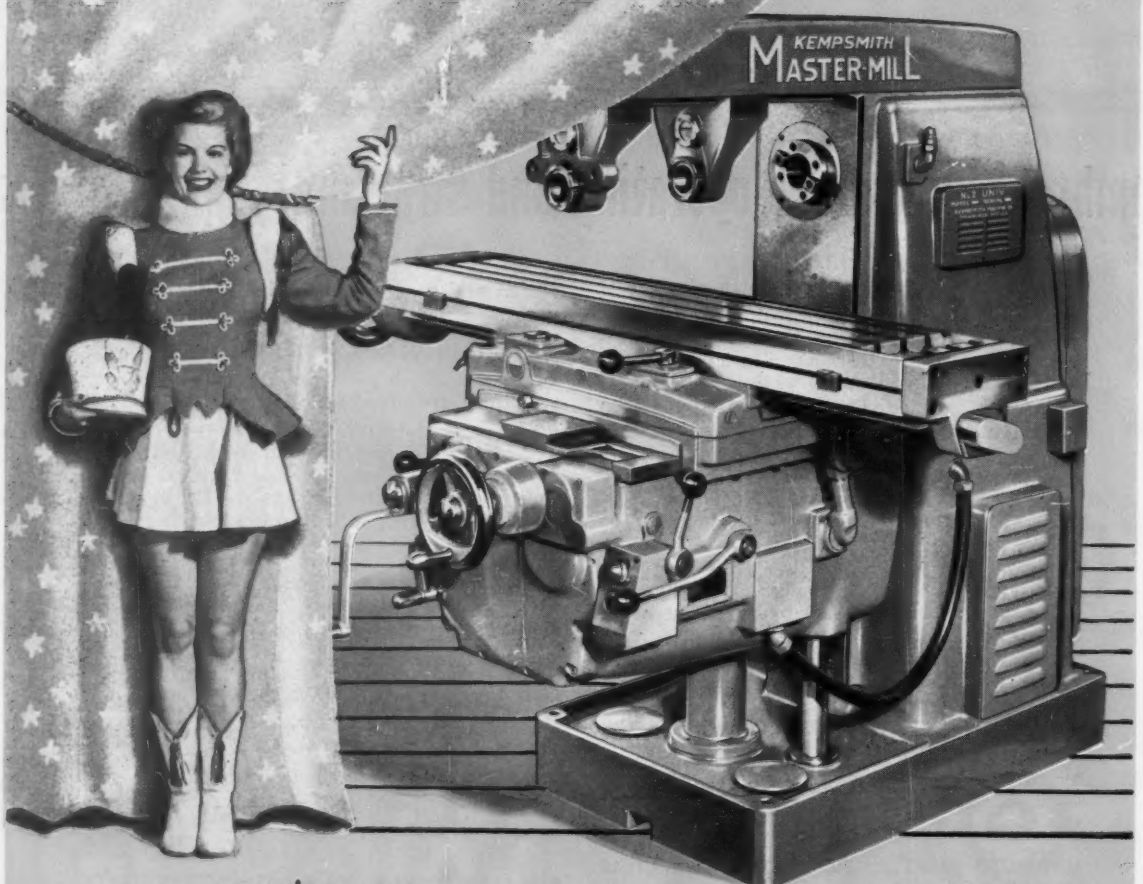
Buffalo • Cleveland • Detroit • New York • Philadelphia

Dealers in principal U. S. cities and major foreign countries

NIAGARA

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

Announcing the NEW KEMPSMITH MASTER-MILL



Hit of the Show at Chicago!

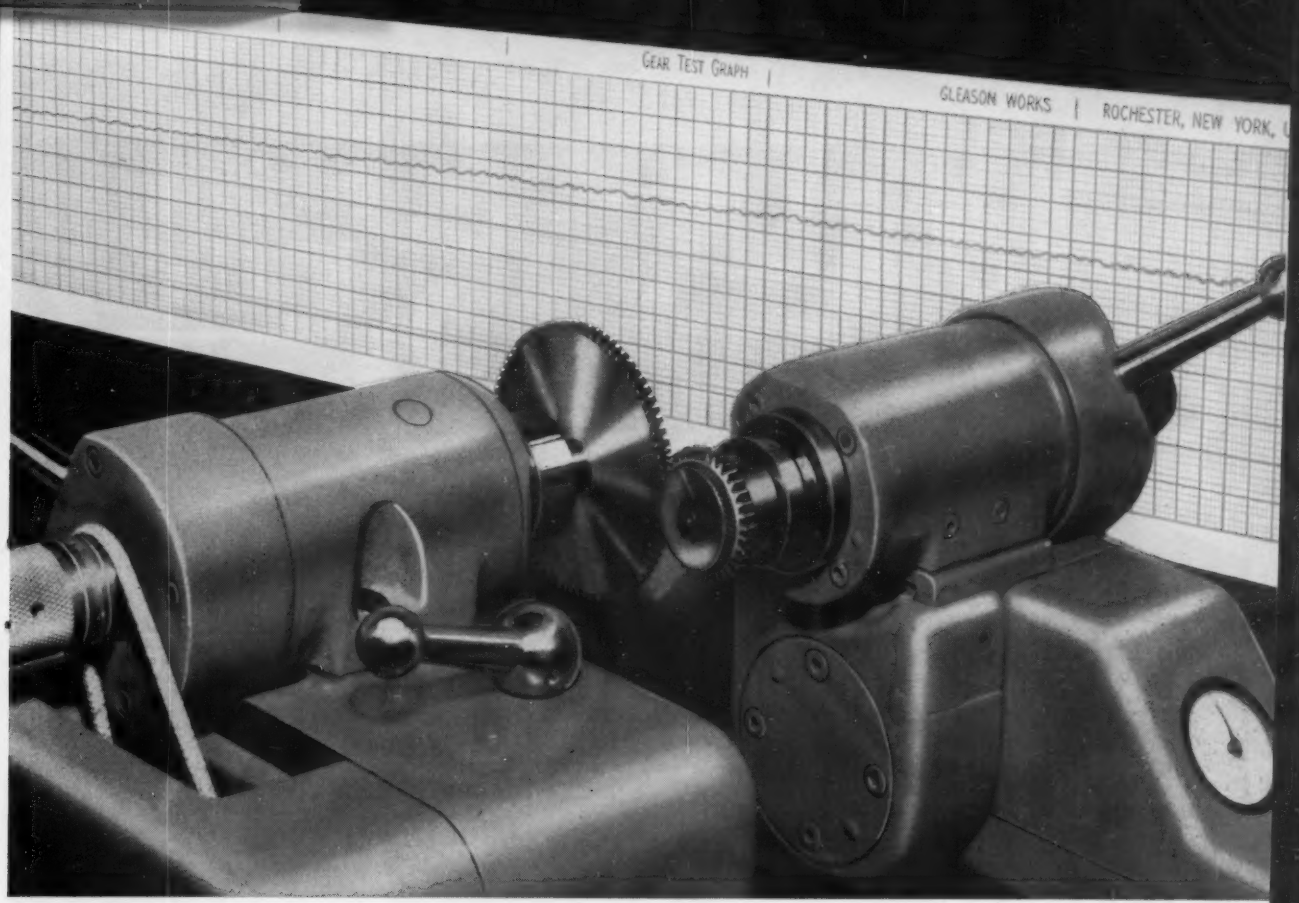
MASTER-MILLS — modern machines for production and general purpose milling — cut milling costs to rock bottom by fully utilizing modern cutting tools and techniques. Conveniently located controls permit more rapid set-ups, thereby providing more cutting time. Low initial cost, plus economy of operation, assure highest return on investment. Now available in sizes No. 2 and No. 3 — Plain and Universal models. For literature, write:

KEMPSMITH MACHINE CO., 1821 So. 71st St., Milwaukee 14, Wis., U.S.A.

Precision-Built MILLING MACHINES Since 1888!

A 8447-1PC

For more information on products advertised, use Inquiry Card, page 243



Make a complete test and record of your small spur and helical gears

You can be certain that your spur and helical gears will operate correctly in their final mountings if you give them a complete test *before* actual assembly.

The new Gleason No. 104 Spur Gear Tester gives you a complete check of your gears. A rolling test for composite error provides a quantitative check of tooth spacing, profile shape and runout.

In this test, the gears are slowly rotated while a calibrated spring load keeps them in metal-to-metal contact. Any error in the gears results in a horizontal movement of the drive spindle. A completely electronic pickup and recorder make a *permanent* chart of the results.

But there is still another test you can make with the No. 104 Tester—a running test, which simulates actual operating conditions, determines the smoothness of operation, noise characteristics, and tooth contact, which will actually be obtained when the gears are used.

This machine tests precision and commercial gears up to 4½" center distance.

We will gladly furnish further information on the No. 104 Spur Gear Tester. Write for our bulletins.

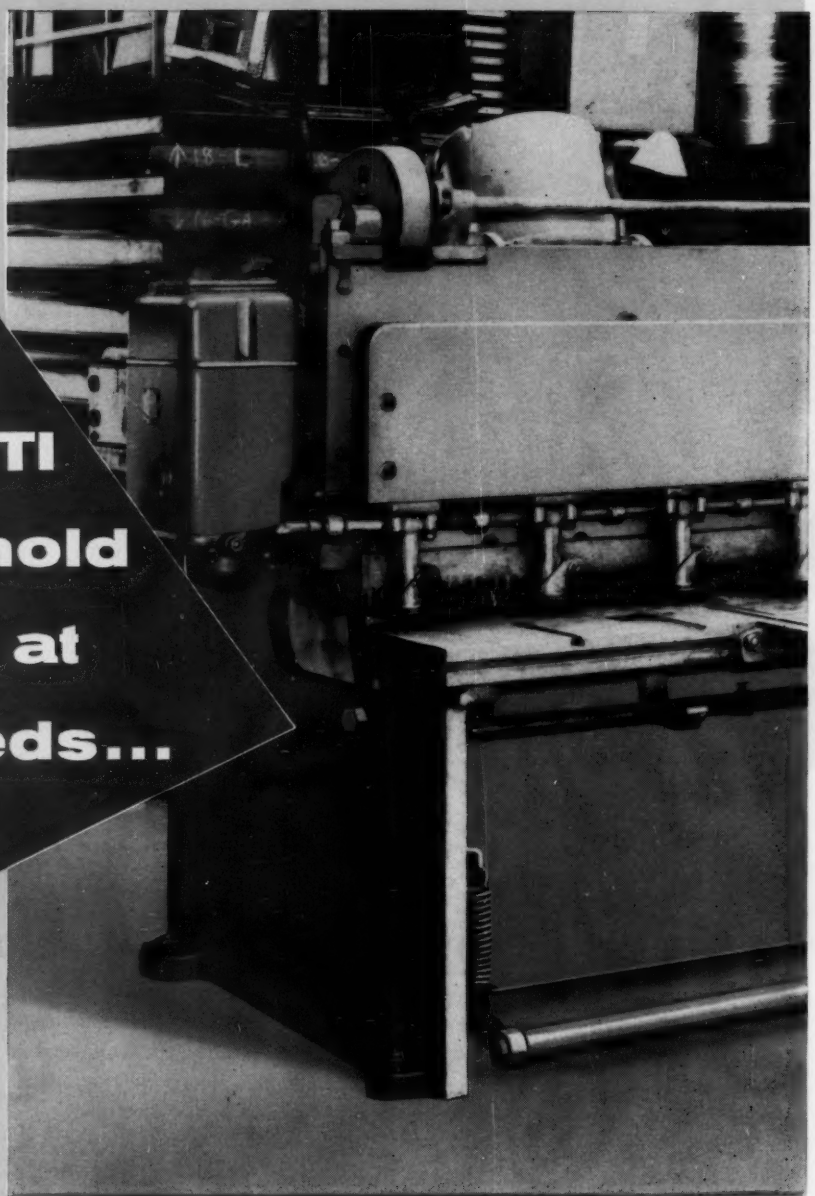
The No. 104 Tester is furnished complete with an electronic pickup and recorder unit, as shown above.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

82



CINCINNATI SHEARS hold accuracy at high speeds...

at **THE HOELTGE BROS., INC.**
Cincinnati, Ohio

For seven years, this Cincinnati Shear has given trouble free performance on manufacturing and jobbing work, blanking 3/16" and lighter steel sheets.

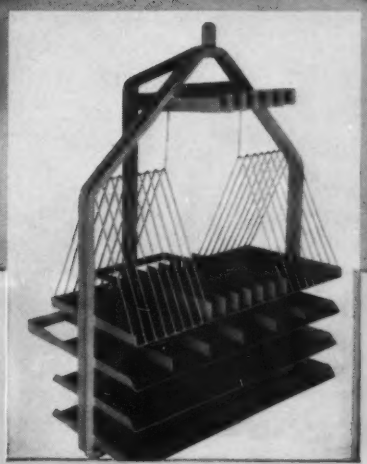
These Cincinnati features are profitable at Hoeltge Bros.:

- Hydraulic holddowns.
- Four-edged knives.
- Accurate back gauge.
- Easy operator control.

Save time with a Cincinnati Shear. They cut materials of various thicknesses without changing knife clearance.

Investigate these money making Cincinnati Shears. Write for Catalog S-7.

Photos courtesy Hoeltge Bros., Inc., Cincinnati, Ohio.



4′ x 3′ x 2′ Overhead Conveyor carrier.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

Use WELDED STEEL for Greater Strength with Less Weight!

Thousands of weldments of many shapes, sizes and weights are produced by Mahon every year. Those illustrated here are typical of parts and assemblies produced for manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. If you require parts or assemblies, including large heavy pieces where time and pattern costs are a consideration, you can turn the job over to Mahon with complete confidence, because Mahon's service to users of welded structural or heavy plate fabrications is complete from design to finished machining and assembling. If you are a buyer of weldments, or welded steel in any form, you, too, will find in the Mahon organization a unique source . . . a source where design skill and advanced fabricating techniques are supplemented by craftsmanship which assures you a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication. See Sweet's Product Design File for information, or write for Booklet showing Mahon facilities and capabilities to serve you well.

THE R. C. MAHON COMPANY • Detroit 34, Michigan
SALES ENGINEERING OFFICES in NEW YORK and CHICAGO

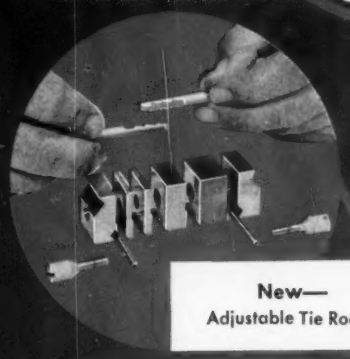
Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON

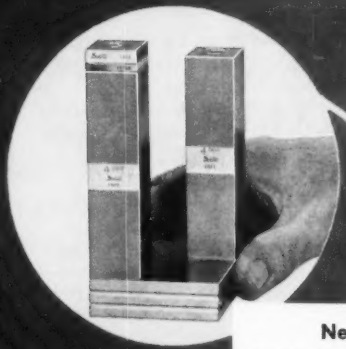
For more information on products advertised, use Inquiry Card, page 243

NEW SQUARE BLOCK GAGING SYSTEM!

New—
Indicating Gages, Scribers and Pin Gages!



New—
Adjustable Tie Rods!



New—
Double Stack Base Blocks!

Greater Accuracy . . . Greater Usefulness
Faster, Easier Gage Assembly . . .

Accuracy of gage block calibration depends upon *surface finish!* New DoALL Square Blocks have the finest finish of any in the world—0.6 micro-inches R.M.S. or better! Calibration error is reduced to a new minimum for commercial gage blocks.

To preserve and make full use of this superior accuracy, DoALL has developed completely new and different accessories. The combination sets an entirely new standard for precision gaging.

DoALL

The DoALL Company
Des Plaines, Illinois

Turn the page for more factual details.

EXCLUSIVE INDICATING GAGE ELIMINATES "FEEL".

In precision measurement in the range of 1/10000 inch, the human sense of "feel" fails. Now, DoALL offers universal dial indicator sets for use with any make of square blocks to eliminate human error.

Make Millionths-Accurate Gages Quickly at Low Cost

With new ultra-accurate DoALL Square Blocks and new versatile accessories, you can make thousands of precision gages quickly at a fraction of the cost of special gages . . . use them in the inspection department, in the toolroom *and in the shop* . . . get greater dimensional accuracy, prevent costly errors. Why be satisfied with less? The cost per gage is low—blocks incur very little wear when used with DoALL Accessories.

Ask for a Free Demonstration

See a DoALL Square Block Gaging demonstration at your own plant, free of charge and without obligation. Compare them, try them, judge for yourself. Call your local DoALL Store or write: The DoALL Company, Des Plaines, Illinois.

Ask for Literature describing DoALL Square Blocks and Accessory Sets.

MANUFACTURED BY DoALL in an entirely new, air conditioned and magnificently equipped gage laboratory. View shows lapping according to a DoALL-developed probability formula. Three-color interferometry is used at DoALL to calibrate Master blocks.

A COMPLETE LINE OF DIMENSIONAL QUALITY CONTROL EQUIPMENT

Square Gage blocks and Accessories • Rectangular Gage Blocks and Micro-Step Gaging System • Mechanical and Electric Comparators • Black Granite Surface Plates, Straight Edges, Angle Plates, Toolmakers' Flats, Parallels, Magnetic Chuck Platforms • Optical Comparators and Charts and Fixtures • Stereomicroscopes • Brinell Microscope • Toolmakers' Microscopes • Sine Bars and Plates • Optical Flats • Monochromatic Lights • Surface Roughness Scales • Mobile Inspection Units • Micrometers and Calipers • Plug and Ring Gages . . . and many other items!

DoALL

Friendly DoAll Stores . . . (in 37 cities)

ersonalized Service . . . Complete Stocks . . . Local Delivery

Call Your DoALL Service-Store
DoALL
SAW BANDS
DoALL GRANITE PLATES
Machine Tools • Cutting Tools • Measuring Instruments
Shop Supplies • In Stock
The DoALL Company, Des Plaines, Ill.

EDUCATIONAL STUDY WALL CHARTS

Economic Principles

$1.00 each postpaid

Lower quantity prices

40th YEAR NEWS

PARKER RUST PROOF COMPANY

PUBLISHED BY PARKER RUST PROOF COMPANY FOR THE METALWORKING INDUSTRY

On this, our Fortieth Anniversary, our humble and grateful thanks to those we have been privileged to serve during two World Wars, the Great Depression and now our period of greatest prosperity.

Parker Rust Proof Company,
R. W. Englehart, President

A LIST OF "FIRSTS" BY PARKER RUST PROOF

1. First commercial phosphate rust-proofing process (1915).
2. First high speed production phosphate rust-proofing process.
3. First process for spray application of phosphate coating materials.
4. First steel mill application for phosphate coating galvanized sheets.
5. First phosphate coating of ordnance items.
6. First substitute for tin in tin cans.
7. First phosphate coating process for wear resistance on machined elements.
8. First process for cold drawing seamless and welded carbon steel tubes.
9. First process for cold drawing stainless steel.
10. First process for cold extrusion of metal.
11. First process for treatment of metal to permit elimination of ground coat in porcelain enameling of metal (1955).

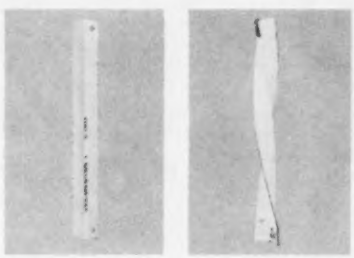
BIRTHDAY TWINS: NEW PRETREATMENT FOR PORCELAIN ENAMEL; BONDERITE WITH ICRA

Two new Parker products have been announced within a few months of the company's 40th Anniversary. One is a revolutionary new approach to porcelain enameling on ferrous metals, the other is a refinement in phosphate coating to produce more durable, more attractive paint finishes.

Parker Pre-Namel 410

This new Parker product, a pretreatment used to prepare ferrous metals for porcelain enameling, eliminates the need for a ground coat, makes it unnecessary to use premium alloys, permits application of finish coat directly on the metal.

One-coat porcelain enameling over Parker Pre-Namel 410 is simpler and more economical to produce. Durability of the finish is improved, too, as shown by standard ASTM and PEI tests. Rejects and parts for re-operation are reduced to a degree never before possible. 98% acceptance has been attained in production test runs. Plant men familiar with the product estimate that economies through Parker Pre-Namel 410 will amount to from 1 to 3 cents per square foot of enameled surface.

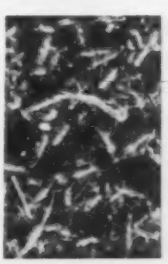


Left: Conventional two-coat porcelain enamel on enameling iron angle failed when twisted 70°. (Metal, twisted less than its elastic limit, returned to original shape.)
Right: Finish coat only, over Parker Pre-Namel 410 on enameling iron angle, withstood 240° twist before failure.

Parker Pre-Namel has been thoroughly tested for two years. It is ready now for use in production applications on the various types of articles finished with porcelain enamel.

New Bonderite Has Built-In Crystal Refining Agent

Series 800 Bonderites contain ICRA (Internal Crystal Refining Agent). This new built-in control produces a denser, finer, more uniform crystalline structure which results in improved paint adhesion and greater luster and reflectiveness.



Photomicrograph, 100X, of steel panel after phosphate treatment without ICRA. Note large crystals.

Photomicrograph, 100X, of steel panel after treatment with Bonderite with ICRA. Note fine, dense crystals.

This new series of Bonderites has the simplicity of operation and control, the uniformity of results and the over-all economy that characterizes all Parker products.

There's a formulation to meet almost every requirement of material to be treated, type of equipment and operating speed.

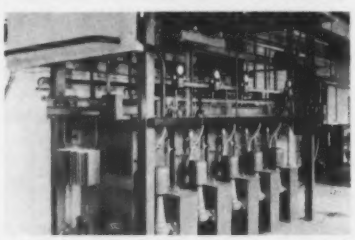
AUTOMATION IN FINISH SYSTEMS IN 1928

Automatic handling of materials through a series of operations—"automation"—is new in name only to Parker. Among the contributions of this company to the metalworking industry has been the development of straight line production, without intermediate handling, of parts through cleaning, metal preparation, dry-off and painting.

Parker's engineering department, working with conveyor and equipment companies, pioneered the first continuous dip-treatment installation in 1928, in which wheel rims were carried through cleaner, rinse and Parco Compound tanks by conveyor.

When faster-acting Bonderites were developed by Parker research, spray equipment was designed to accomodate the higher production speeds it made possible. The reduced costs and higher uniform quality, that comes with automatic operation, were made available to users of Parker Products years ahead of other automatic processing.

"GOLD STANDARD" IN PANELS FOR PAINT TESTS



This automatic machine treats panels with Bonderite on a production basis to meet the demands of Parker customers.

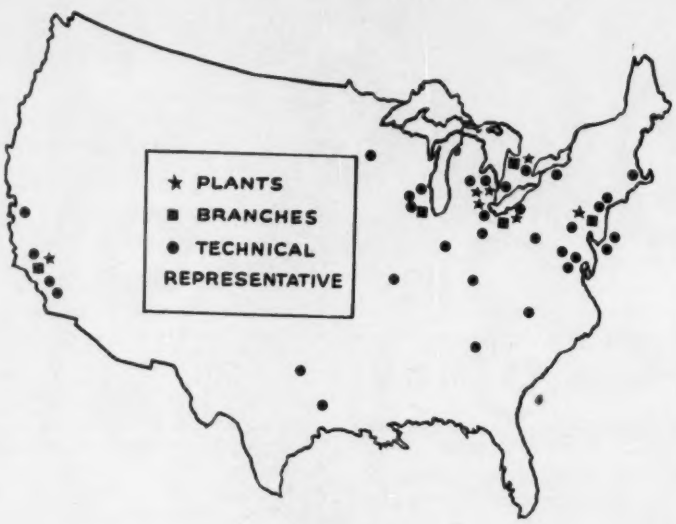
The Bonderite-treated panels prepared in Parker's service laboratories are the Gold Standard used in testing paint performance. To evaluate new paints and maintain quality control on production, manufacturers will use over one half million of these Bonderite-treated panels this year. When you use Bonderite in your plant, you are using the recognized leader in the field.

New Products, New Methods Come from Parker's Research Laboratories

There has been a research department at Parker for as long as there has been a company. In the early days it was a one- or two-man department. Now the technical staff numbers over 100. Parker research is responsible for the products and processes listed under "Parker Firsts" on the preceding page, and for hundreds of refinements and short-cuts that have meant money, time and material savings for plants throughout metalworking.

Parker's customers profit by having this imaginative, productive, and experienced research program working for them.

LOOK HOW CLOSE PARKER MEN AND PARKER PRODUCTS ARE TO YOU



Fast supply and service are important in the Parker package! The map shows coast-to-coast locations of plants, branch offices and technical representatives. No matter where you are, there's Parker service quickly available.

Parker technical representatives, backed by the most extensive know-how and experience in the industry, are themselves thoroughly experienced. The average Parker field representative has 11 years on the job!

WORLD-WIDE EXPERIENCE! Parker and its affiliates in Germany, England and France share over 125 years of experience in this specialized field.

For full information on any of the products listed below, call or write

PARKER RUST PROOF COMPANY, 2167 East Milwaukee, Detroit 11, Michigan

***Bonderite**
corrosion resistant paint base

***Parco Compound**
rust resistant

Bonderite and *Bonderlube
aids in cold forming of metals

***Parco Lubrite**
wear resistant for friction surfaces

***Parker Pre-Namel**
pretreatment for porcelain enameling

Tropical Paints
maintenance paints for industry since 1883

**Reg. U.S. Pat. Off.*

How The AMERICAN PULLEY COMPANY subjects its cost savings opportunities to careful analysis

WHILE over-all programs are given tentative approval, each item is analyzed on Form No. 753, "Request for Capital Expenditure". A sample of a comparatively recent analysis is illustrated. For major items, those in excess of $10,000 a confirming analysis is made through use of the MAPI formula.

C. E. BAIN, JR.
Mgr. of Mfg.

REQUEST FOR SPECIAL OR CAPITAL EXPENDITURE

Project No. 1213
Date 8/17/53

Dept. 49

A - Original Cost of Replaced Unit $13,393.00
B - Cost in Excess of Replaced Unit 14,507.00
C - Total Cost of Replaced Unit 27,900.00
D - Less Salvage Value Replaced Unit 12,000.00
E - Net Cash Outlay Required
F - (Less) Deprec. on Replaced Unit
G - Net New Cash Investment

Estimated annual saving $ 4,562.50. Investment to be recovered in 42 months.
Is item included in Budget? Yes X No Year 1953-1954

Operations to be performed:

Hobbing teeth of gears and pinions

Is there any other equipment installed on which this work can be performed? #3062, 2188, 3082
Is such equipment now operating on a single or double-shift basis? double
Estimated cost of tools required to place production on present equipment

Necessity and Proposed Benefits:

We will hob faster due to improved hob spindle construction and being able to climb hob. We will replace three machines with two machines. The proposed machines have automatic hob shift which will result in an estimated 25% tool cost saving.

Classification: (Underscore)
Group 1: Replacement; Improved Mfg. Methods; Increased Capacity; Plant Improvement; Maintenance; Rebuild; Safety; Improved Quality; Change in Design; Increased Sales Volume.
Group 2: General Purpose; Special Purpose.

Proposed Equipment - Description:

2 - #16-16 Barber-Colman Gear Hobbers

Type of Products to be Manufactured:	Annual Sales	Net before Taxes
#1 to 6 SRU H.S. Gears, #0, 1, 2 & 3 C.S. Pinions #0 & 1 SRU L.S. Gears	Last Year $	$
	This Year $	$
	Next Year $	$

Equipment to be replaced:	3062	2188	3082
Asset Number			
Description	Type "A"-B-C Hobber	Type "A" -B-C Hobber	Type "A" -B-C Hobber
Year Purchased	1945	1943	1946
First Cost	$3,389.00 (2nd hand)	$4,905.00	$5,099.00 (2nd hand)
Net Book Value	1,253.93 @ 8% yr.	0.00 @ 20% yr.	1,529.70 @ 10% yr.
Salvage Value	4,000.00	4,000.00	4,000.00
Disposition	sell	sell	sell

Form 753

DETAILS OF PROPOSED EXPENDITURE $22,800.00

1.	Required expenditure for equipment only	$ 250.00	
2.	Necessary incidental expenditures for:	300.00	
	a. Electrical equipment	2,025.00	
	b. Freight (include out and in on rebuilt equipment)	2,575.00	25,375.00
	c. Foundations and installation		2,525.00
	d. Accessory equipment		$27,900.00
	Total of a, b, c, and d		
	Total of 1 and 2		27,900.00
	Contingency (approximately 10%)		15,000.00
	TOTAL EXPENDITURES FOR FIXED CAPITAL		15,900.00
3.	Estimated rearrangement expense on account of purchase		
4.	TOTAL EXPENDITURE FOR THIS PROJECT		
5.	Less estimated amount to be realized from sale or transfer of replaced items		
6.	NET EXPENDITURE ON ACCOUNT OF THIS PROJECT		

SAVINGS BY COST COMPARISON--PRESENT VS. PROPOSED EQUIPMENT

		Estimated Annual Present Equipment	Expenditure Proposed Equipment
8.	Direct Labor (including cost of set-up)	$ 4,838.28	$ 3,203.25
9.	Direct Material	450.00	100.00
10.	Maintenance of equipment	3,511.90	2,633.42
11.	Overtime		
12.	Expense tools and supplies	4,526.36	3,043.12
13.	Indirect labor (inspection, trucking, crane operation, material handling)	562.26	150.00
14.	Overhead 95 % of direct labor	1,762.92	2,092.50
15.	Spoilage losses		168.00
16.	Depreciation a. Present 8.20.10%	252.00	11,390.32
	b. Proposed 7-1/2 %	15,952.82	
17.	Other specifications: floor space, taxes, power fuel, etc. (itemize)		4,562.50
18.	TOTAL ESTIMATED ANNUAL EXPENDITURES (Items 8 to 17 incl.)		
19.	NET ESTIMATED ANNUAL SAVINGS (Estimated Annual Expenditures with present equipment less estimated annual expenditures with proposed equipment (Item 18)		
20.	Expected annual production next 12 months Units. Following 2 years Units.		
21.	Above cost comparison is based on annual production of Units.		
22.	Net expenditure on account of this new equipment will be recovered in savings in 3-1/2 years.		

Request initiated by J. Richards, Manager of Engineering
Recommended by _____, Manager of Manufacturing
_____, Sales Manager
Approved by _____, President

Keep gathering metal-working production ideas . . . be well informed when the time for replacemen arrives . . . .

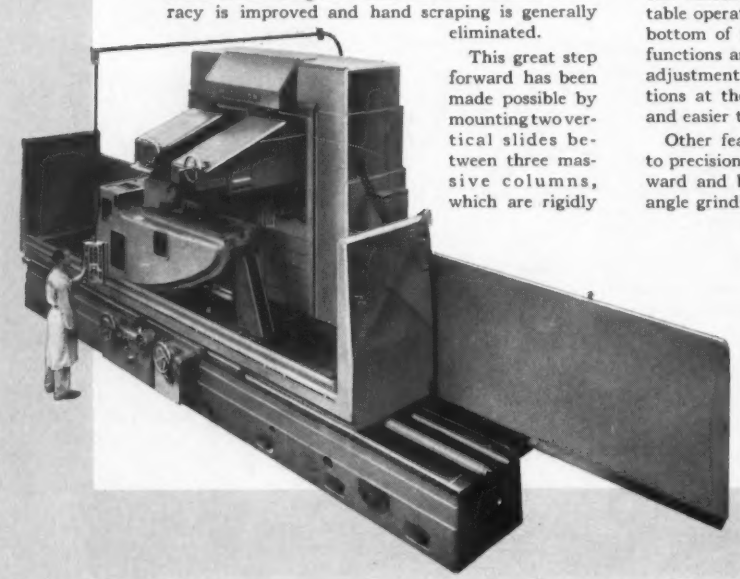
ROCKFORD INSERT GROUP

October, 1955

NEW MATTISON COMBINATION WAY AND SURFACE GRINDER

Machines large, heavy castings faster, to closer tolerances, at lower over-all cost!

IT is now possible for machine tool builders to grind both "V" and flat ways of large bed castings, keeping all surfaces in accurate, relative alignment, and finish the operations in a single setup! For, independent horizontal and vertical spindles of the new Combination Way and Surface Grinder permit you to machine a variety of surfaces (illustrated below) on beds, columns, tables, slides, saddles, and heads . . . with maximum flexibility and ease of control . . . without removing the work from the machine. Accuracy is improved and hand scraping is generally eliminated.



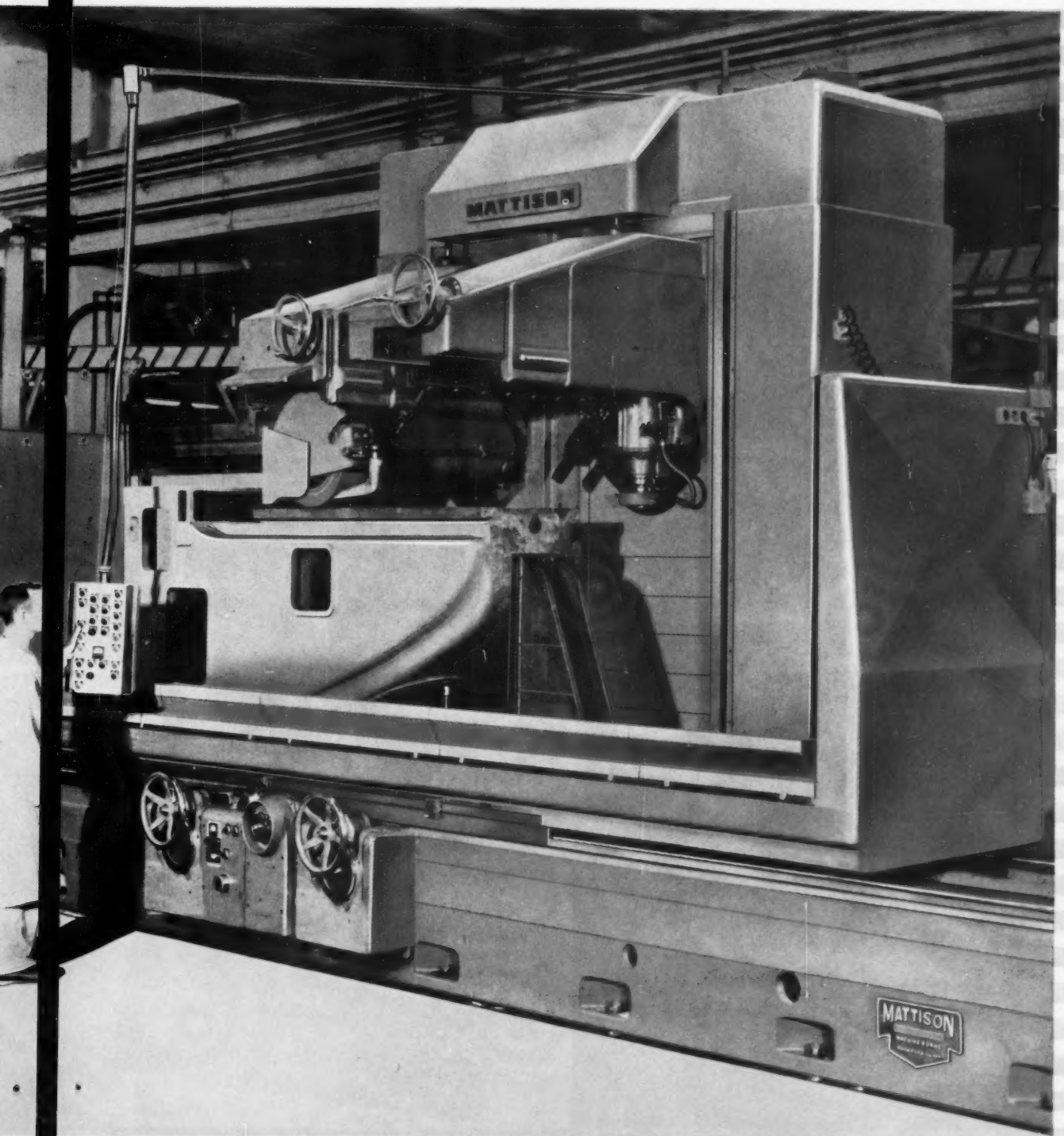
This great step forward has been made possible by mounting two vertical slides between three massive columns, which are rigidly bolted and doweled to the base casting and reinforced at the top by braces. This box-type, three-column construction assures absolute rigidity for the wheel slides, permits faster stock removal, finer finish, and closer limits of accuracy.

Every function of the machine which can be controlled electrically is actuated from the pendant control panel. Pendant is arranged in control zones. One zone controls all functions of the left-hand spindle. Another controls the right-hand spindle. All table operating controls are located in a zone at the bottom of the pendant. Within the control zones, functions are separated into actuating controls and adjustment controls. With all major control functions at the operator's fingertips, grinding is faster and easier than ever before.

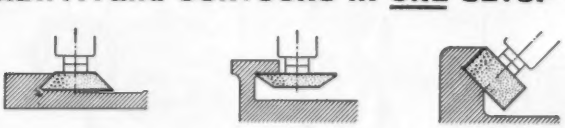
Other features of the machine which contribute to precision production include: full 45° swivel (forward and back) of the vertical grinding head for angle grinding; isolation of the hydraulic system to remove vibration and heat distortion from the operating area; completely automatic lubrication system; and hydraulically powered dressing equipment for both spindles. Write for literature describing many other unique features of the new Combination Way and Surface Grinder!

GRINDS "V"-TYPE and FLAT WAYS . . . DOVETAILS . . . SHOULDER and EDGE WORK . . .

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U. S. A.**



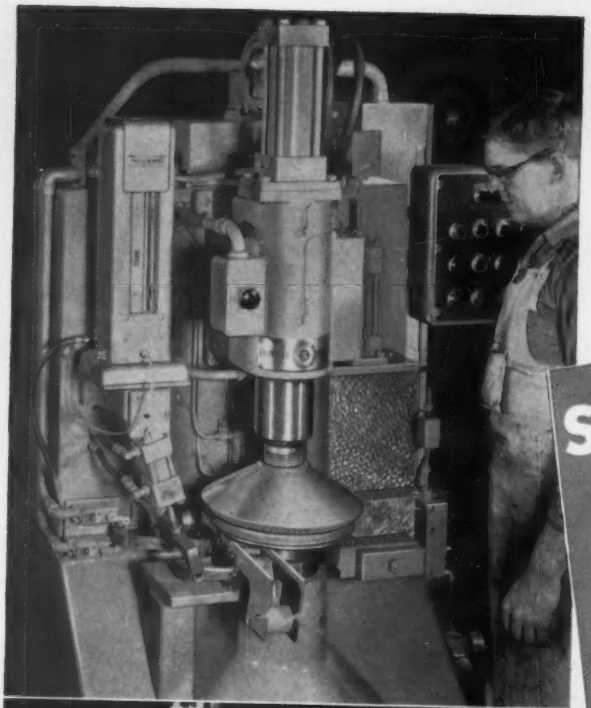
...RADII ... and CONTOURS IN ONE SETUP

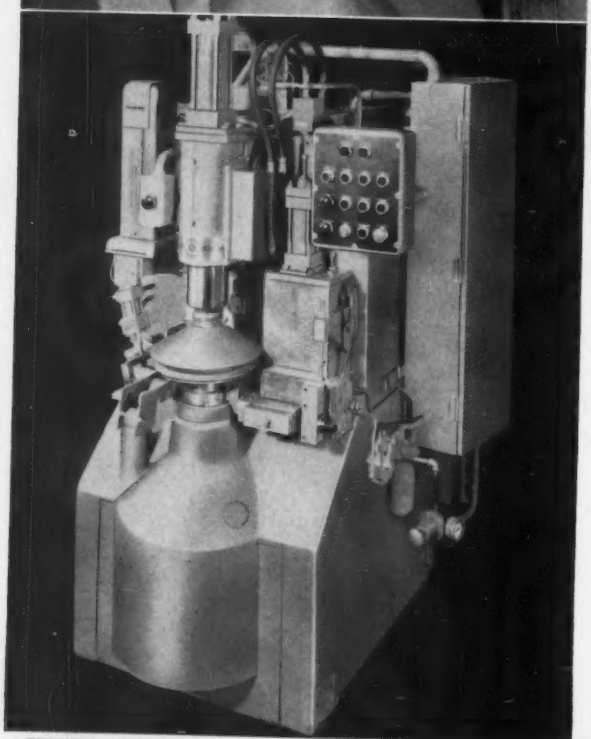


MATTISON
MACHINE WORKS
ROCKFORD ILL. U.S.A.

HIGH-POWERED
PRECISION
SURFACE GRINDERS

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U. S. A.**





NE

SUNDSTRAND Vertical Automatic Production Lathe

. . . a basically standard machine with platens for mounting:

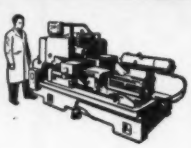
1. Turning or Grooving Slides or,
2. Multiple Tool Slides or,
3. Tracer Slides

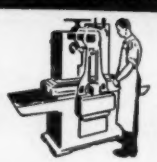
SUNDSTRAND

50 YEARS OF *"Engineered Production" Service**

*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

W!

a simplified basic design... easily adapted to problems in production work

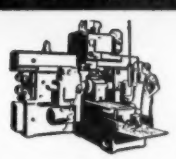
Oftentimes manufacturers have found it necessary to purchase "more machine" than needed to handle the production job at hand. This is particularly true for production turning operations. But here is a practical Sundstrand solution for a new machine of simplified basic design to which different slides can be applied in accordance with your work requirements.

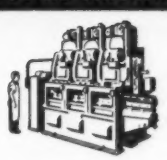
The new Sundstrand vertical lathe is designed so that one operator can handle several machines. It is an excellent example of a standard machine easily adapted to production work. It has the spindle, tailstock and slide mounted in a vertical position, thereby reducing the amount of floor space required and making it easy to apply automatic handling. Machine capacities range from 5 to 25 H.P. If you have production turning problems be sure to investigate this new machine.

for additional information

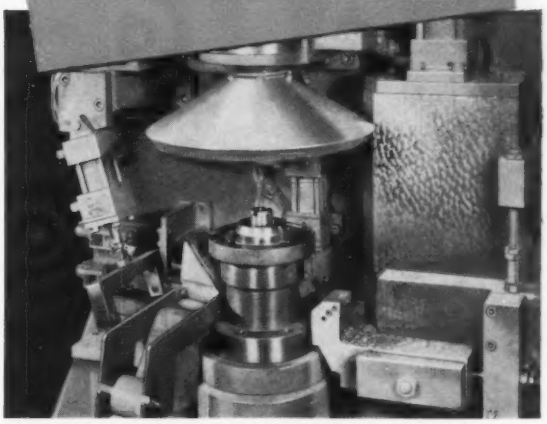
Concerning the possibility of profitably applying this machine to your work send part prints, production requirements and all pertinent information on your job requirements. We will be pleased to furnish you with a preliminary estimate of what you can expect in performance from this machine. There is no obligation for this service.

TRIPLEX RIGIDMILS | SPECIAL MACHINES

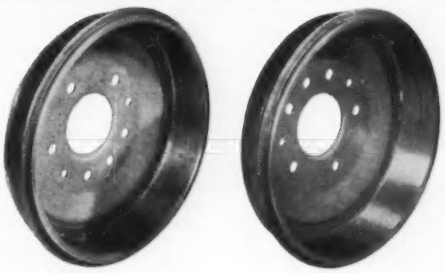




A TYPICAL INSTALLATION



Close up of tooling for brake drums and close up of operations, below.

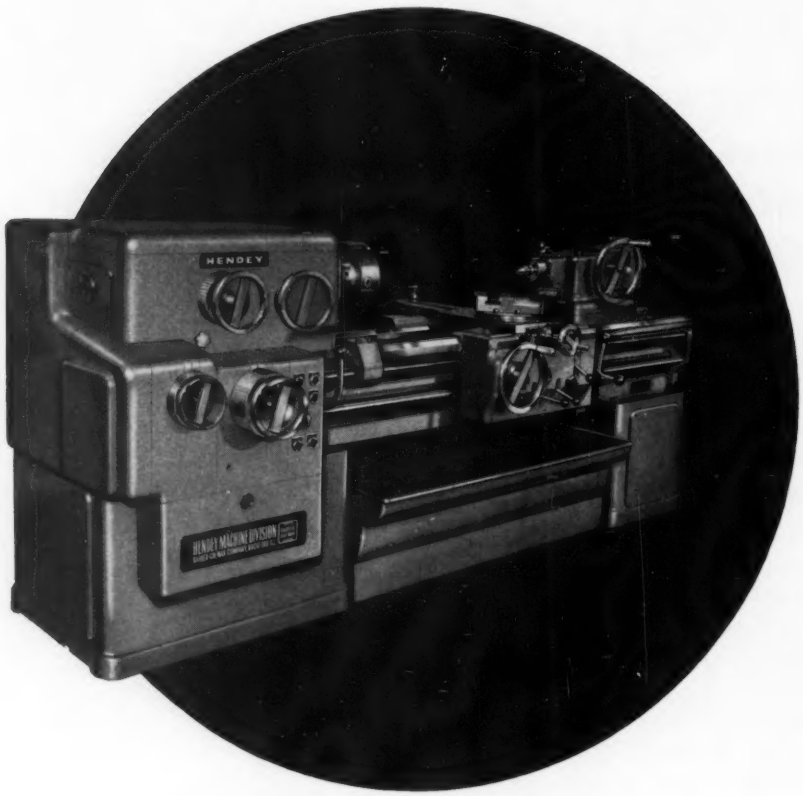


In this installation the operations consist of boring the brake drum. An automatic sanding attachment is arranged to cycle with the machine operation to finish the machined surface. An automatic gaging unit indicates the size of the finish bore of the drum to maintain the desired accuracy.

SUNDSTRAND
Machine Tool Co.
2530 Eleventh St. • Rockford, Ill., U.S.A.

CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**

two new Hendey lathes...



32-Speed Geared Head Lathe

This completely new lathe has a 32-speed headstock with the top eight speeds obtained through a belt drive to assure smooth finish on the work. This machine is equipped with a 15 HP motor, and spindle speeds up to 1500 RPM are available. It is designed to accommodate a 20 HP motor for spindle speeds to 2000 RPM. It can be furnished in 13", 16" and 20" sizes. Exclusive induction hardened and precision ground bed ways provide maximum accuracy and long life. Other features include 66 thread and feed changes, an independent lead screw, automatic lubrication, high-speed reversing mechanism, precision automatic stops, and heavy-duty, two-speed tail stock.

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

for greater accuracy and production

No. 2E Precision Lathe

The new No. 2E Hendey Lathe is a 14" general-purpose precision lathe equipped with "Selectronic" control of spindle speeds. The electronic unit provides closer control over cutting speeds and full torque at slow speeds. It is an exclusive Hendey feature and is custom built for this lathe. Speeds may be pre-set or changed while cutting, and they are infinitely variable from 15 RPM to 1500 RPM. Low speeds are available through back gears. The spindle starts, stops, and reverses with a single lever control. Other features include dynamic braking, automatic lubrication, precision spindle bearings, and hardened and ground bed ways.

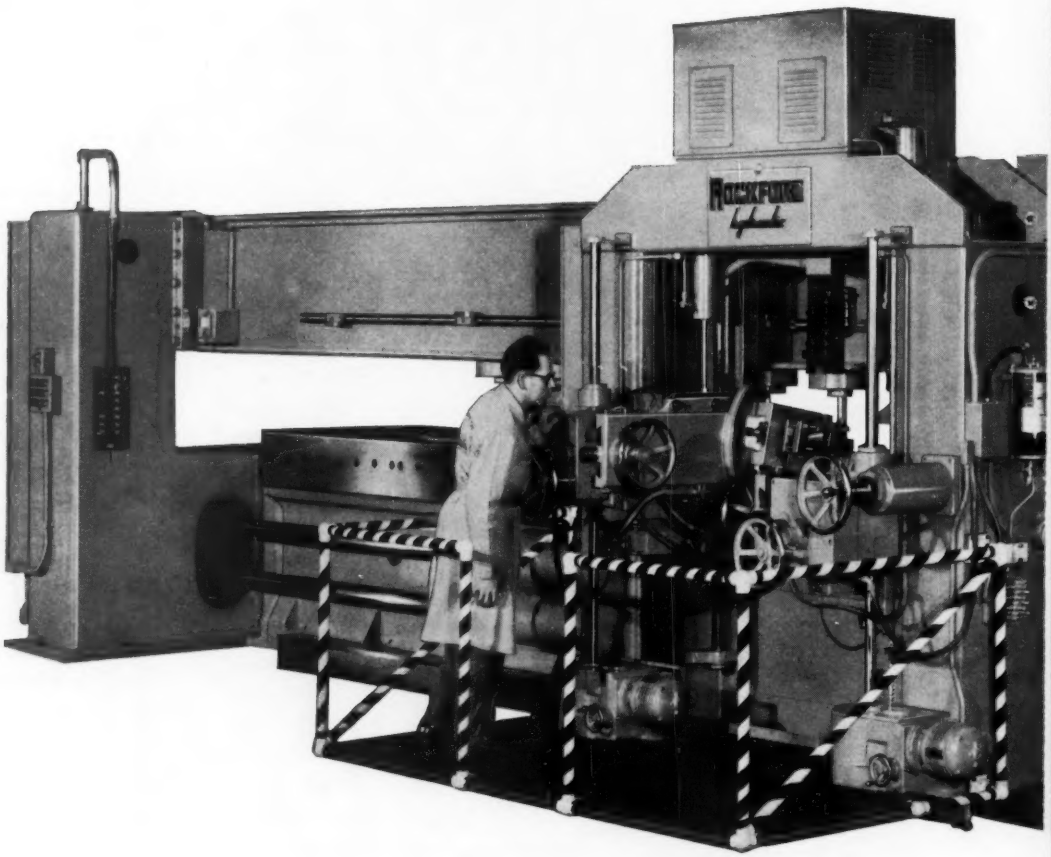
These new modern lathes are Barber-Colman's answer to any questions concerning the future of the Hendey line. They are proof of the strides we have already made and indicate the continued progress which we guarantee in the future. For years Hendey has had a reputation for accuracy. Now, new machines and features provide even closer limits of accuracy and greater production. Electronic and magnetic amplifier drives, induction hardened and precision ground bed ways, and a 32-speed geared head-stock are only a few of the new features available on Hendey lathes. See these new machines in action to determine how they can fill your production requirements.

Hendey **machine division**
BARBER-COLMAN COMPANY
115 LOOMIS ST., ROCKFORD, ILLINOIS

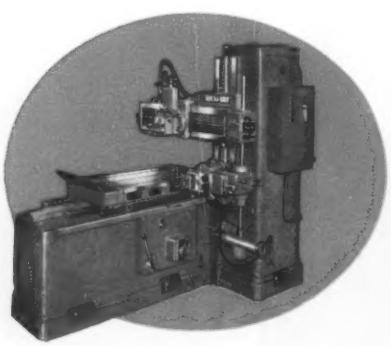
BARBER COLMAN

CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**

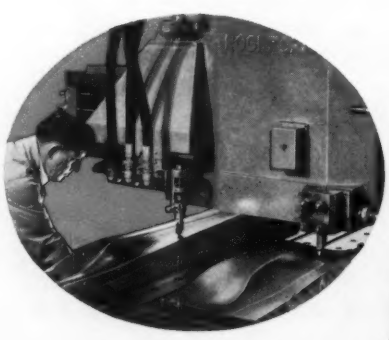
another new hydraulic design...



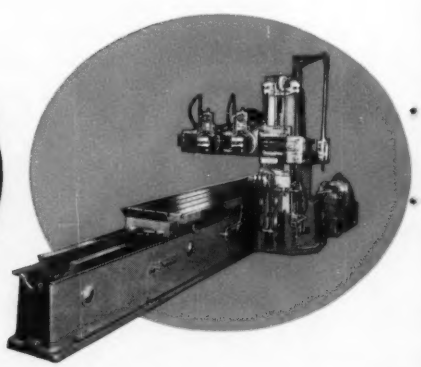
Hydraulic Openside Shaper



Hydraulic Kopy-Kat Duplicator



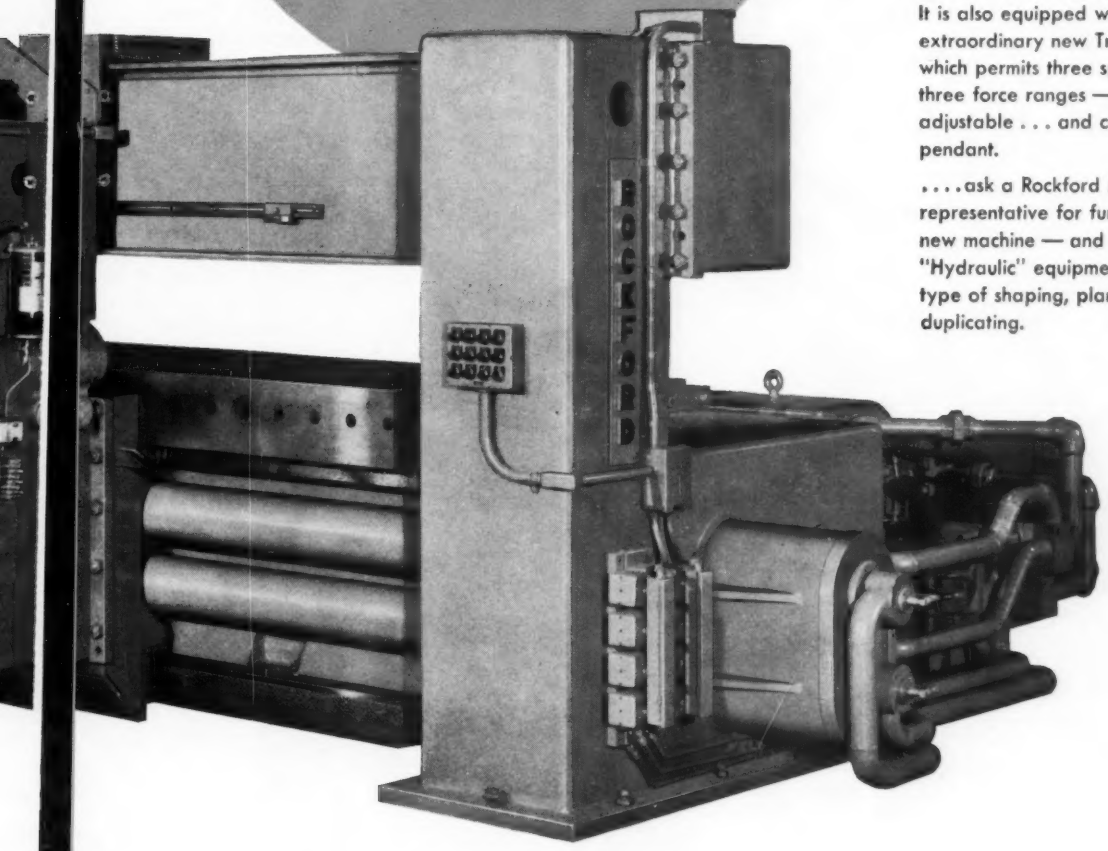
Hydraulic Shaper-Planer



CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

plate edge PLANER

with triple circuit!



....the new Plate Edge Planer is one of the latest developments of the Rockford Machine Tool Co.

....it represents the first basic improvement in this type of machine in the past half century.

....the Hydraulic Plate Edge Planer has a working capacity up to 30' wide x 7 inches thick and its saddle reciprocates from 10 to 200 feet per minute. It is also equipped with the company's extraordinary new Triple Circuit ... which permits three speed ranges and three force ranges — all infinitely adjustable ... and controlled from the pendant.

....ask a Rockford Machine Tool Co. representative for further details on this new machine — and how modern "Hydraulic" equipment cuts costs on every type of shaping, planing, slotting and duplicating.

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

Hy-Draulic

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**

EQUIPPED WITH SPIN-GRINDING ATTACHMENT...

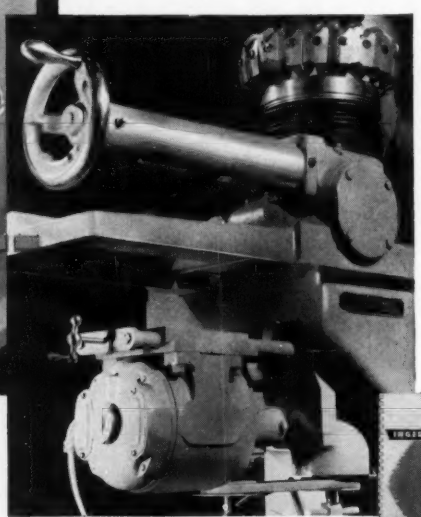
NEW INGERSOLL CUTTER GRINDER SAVES 440 HOURS PER YEAR!

Day-by-day use of new Ingersoll Cutter Grinders in our own plant shows:

30 MINUTES SAVED in grinding 14" Ingersoll Extra Heavy Duty Shear Clear Face Mills with 16 new, carbide-tipped blades.

18 MINUTES SAVED in grinding 6" Ingersoll Heavy Duty Shear Clear Face Mills with 12 new, carbide-tipped blades.

Average Saving of 22% when spin-grinding cutter blades to equal height before sharpening . . . 440 hours in a year of 40-hour weeks . . . double that amount on a two-shift operation.



The Spin-Grinding Attachment converts the new Ingersoll Cutter Grinder into a cylinder grinder which will quickly grind all blades to uniform height on both face and periphery before normal back-off operations.

Price of the New Ingersoll Cutter Grinder, Complete with Spin-Grinding Attachment, is only $4,130.

Write Today for New Cutter Grinder Manual 62B

THE INGERSOLL MILLING MACHINE COMPANY
ROCKFORD, ILLINOIS, U.S.A.

BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES
ORIGINATORS OF SHEAR CLEAR CUTTERS

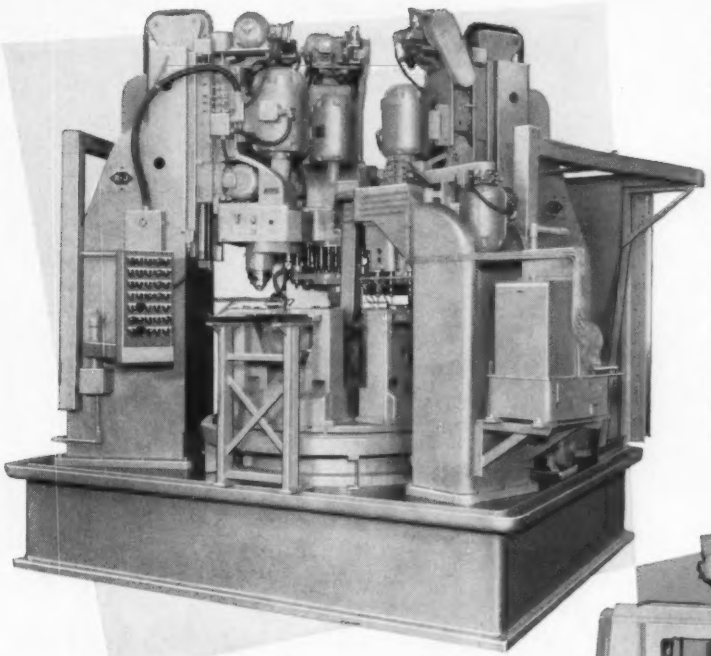
MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

REHNBERG-JACOBSON

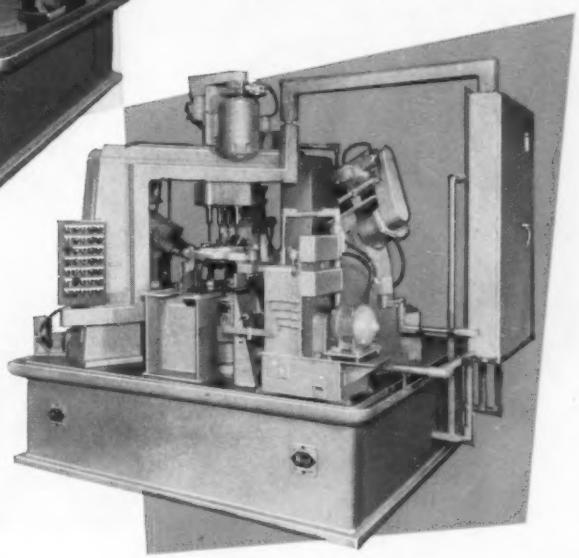
Shows the way to...

PERFORM TWO SEQUENCES OF OPERATIONS ON

FLYWHEEL HOUSINGS



These machines are used to drill, tap, ream, face, bore, and otherwise finish practically all the holes in a cast aluminum flywheel housing cover for a well-known automobile engine. Rated capacity is 150 pieces per hour on each machine. The bigger machine, left, takes the piece open-end up and works on the shaft hole, the starter hole, an assortment of 14 holes in the flanges, and then reaches in to plunge face a surface for clearance. On the smaller machine, below, the piece is placed small-end up; six holes are drilled, and two angular holes are drilled, countersunk, and tapped.



ALL-MECHANICAL R-J UNITS USED

The larger machine has three Rehnberg-Jacobson SF-75 Power Feed Units driving multiple-spindle heads, a special Tapping Unit with individual lead screws, and a 66" five-station automatic Index Unit. The smaller machine uses three R-J No. 45 Drill Units, two standard Tap Units, and a 42" three-station automatic Index Unit. These units are ALL-MECHANICAL, and self-contained. Clamping is hydraulic.

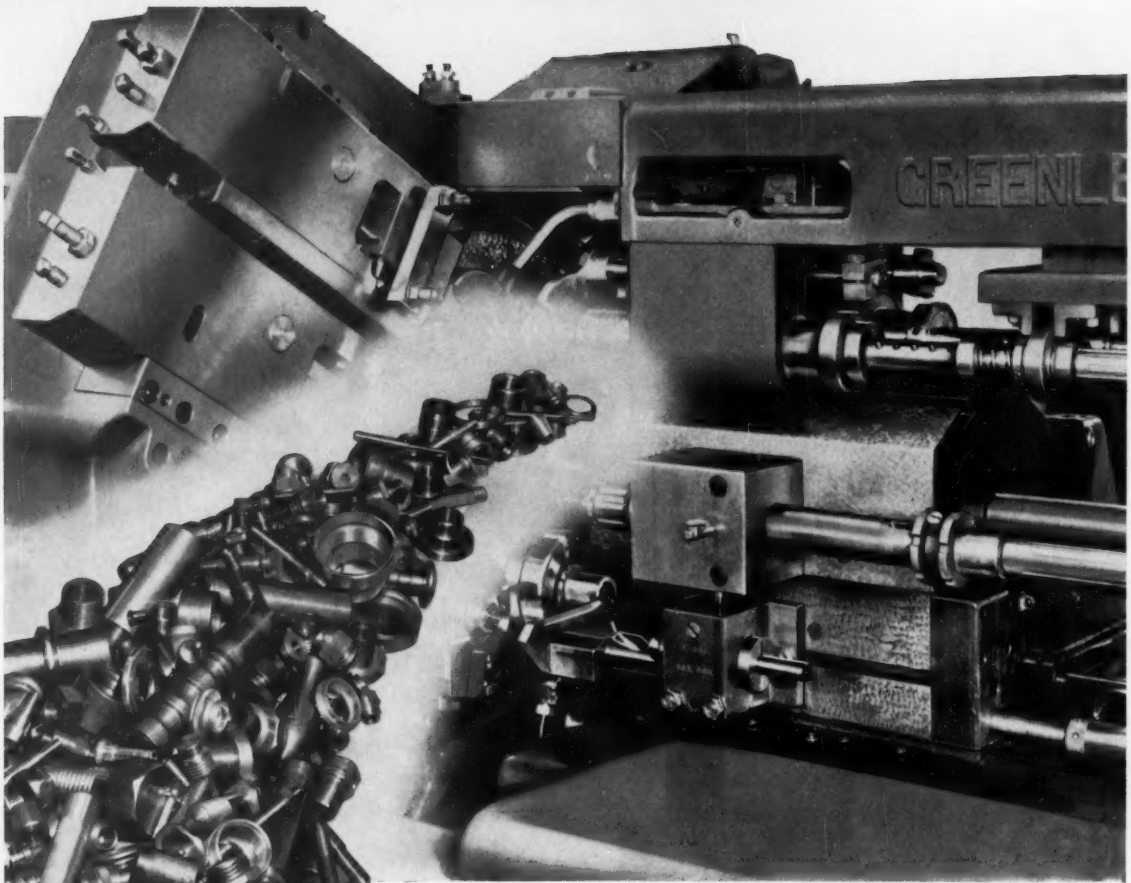
Designers and Builders of Special Machinery

REHNBERG-JACOBSON MANUFACTURING COMPANY

2135 KISHWAUKEE ST.

ROCKFORD, ILLINOIS

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**



PRODUCTION VERSATILITY

ON A GREENLEE 6-SPINDLE AUTOMATIC BAR MACHINE

Greenlee Automatics provide accurate and fast production of an almost endless range of parts. Standardized tooling, wide open tooling area, interchangeable cross-slide cams, built-in threading drive, rapid stroke-setting and other Greenlee advantages provide great versatility, assure a quick and generous return on your equipment investment.

PHONE ROCKFORD, ILLINOIS 3-4881
TO HELP SOLVE YOUR PRODUCTION PROBLEMS

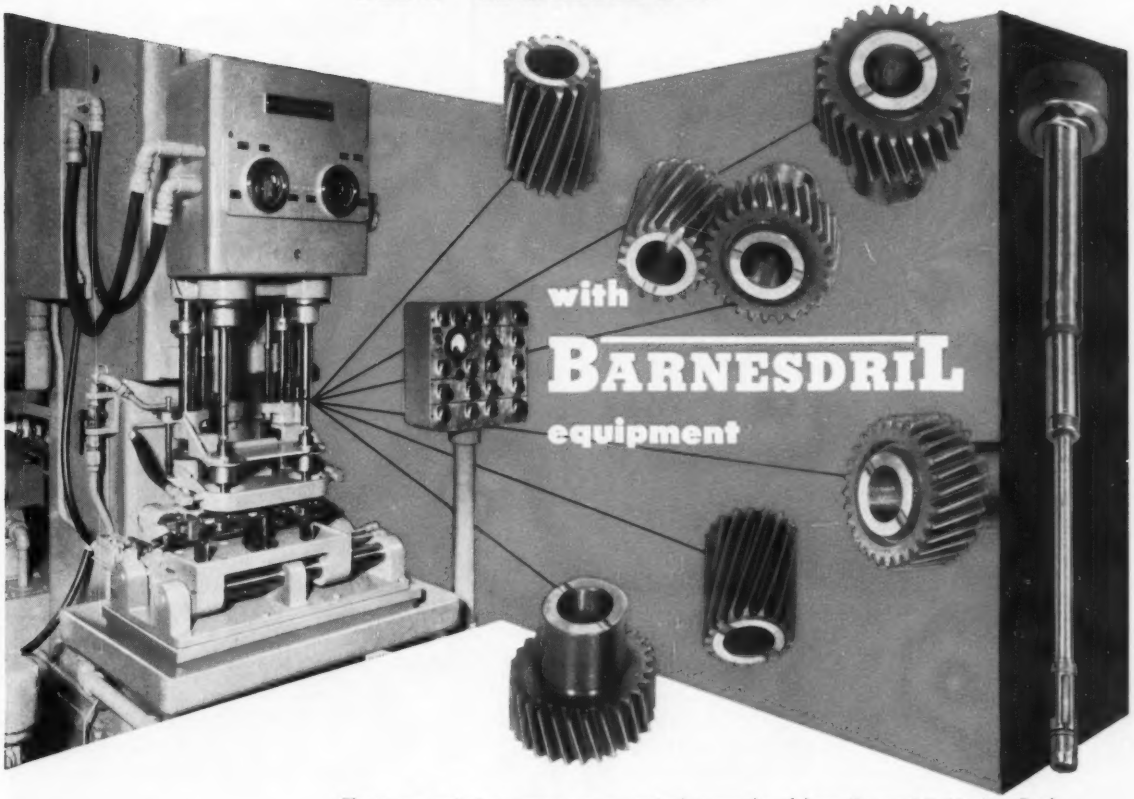
PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1870 MASON AVE.
ROCKFORD, ILLINOIS

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

when the HOLE business is a problem

TRY HONING..

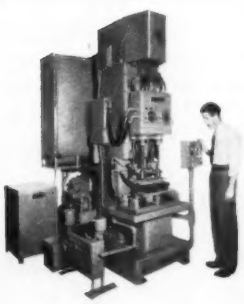


CONTROLLED ACCURACY

CONTROLLED FINISH

These transmission gears are a typical example of how BarnesdriL Honing Engineering simplifies the hole finishing process and supplies accuracy and finish control. Completely automatic control provides bore-to-bore accuracy within .0005", stock removal of .0025", and 10 R.M.S. finish.

Electronic Hone Expansion on this No. 223 2-spindle Honing Machine maintains proper pressure between the stone and work for maximum rate of stock removal, with controlled geometric accuracy of roundness and taper. Because the stone is supported at the cutting edge with controlled feed pressure, longer abrasive life results, with less downtime on the machine for stone replacement.



Plugmatic Sizing provides the most accurate sizing method available, sizing the bore directly with a positive gage. The sizing member cannot be affected by either misalignment or eccentric stone wear, accounting for complete interchangeability of parts finished.

When you have a hole finishing problem, call your BarnesdriL representative, or write...

HOLE BARNESDRIL FINISHING

BARNES DRILL CO.

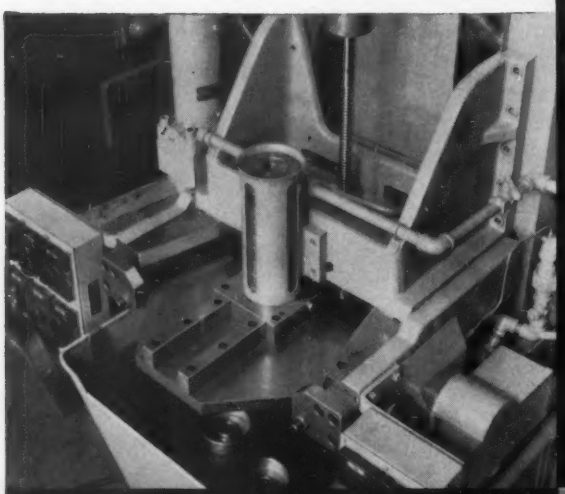
820 CHESTNUT STREET • ROCKFORD, ILLINOIS

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**

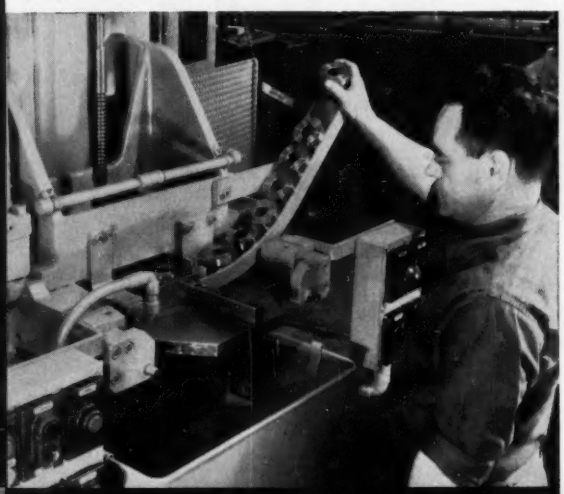
automatic broaching can be low cost broaching the *American* way

The broaching operation can justify automatic set-ups on smaller volume jobs when the tooling is kept relatively simple and the cost low. Illustrated here are two American machines which feature:

1. **Automatic cycle**
2. **Simple tooling**
3. **Magazine or chute feed**



This American vertical pull-up (VP) machine broaches the hub and spline of an automotive clutch hub. A hydraulic slide interlocked to the automatic machine cycle shuttles parts from the tube magazine into broaching position. The parts are broached and then ejected below. The slide automatically moves back during the broaching stroke and reloads a part. Production is over 300 parts per hour.



Here an American VP broaches the I.D. of a sun gear converter part for an automotive transmission. The inclined gravity chute feeds parts into the positioning fixture on the hydraulic slide. Production is over 300 parts per hour. Both machines will run continuously on automatic cycle. The operator only has to keep the magazines filled with parts.

Why not let American help you solve your broaching problems. Just send a blueprint or sample for a free estimate. American makes a complete line of broaches, broaching machines and fixtures. For further information on American VP internal broaching write for Catalog No. 401.

American BROACH & MACHINE CO.

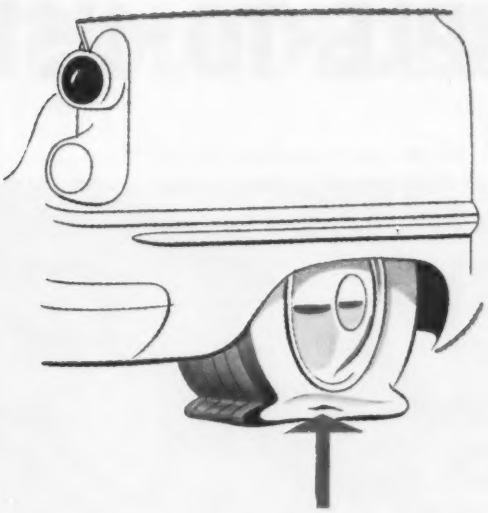
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

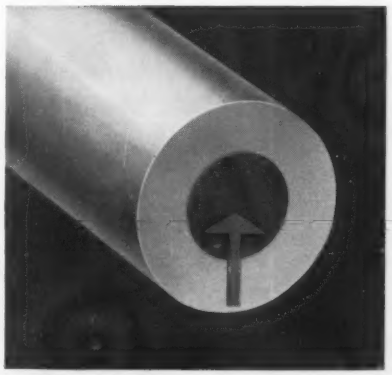
SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**



a hole here is a letdown . . .



a hole here is a lift

Crucible Hollow Tool Steel Bars can step up output on most any production line where ring shaped or hollow parts are made. Why? Simply because the hole is already there. There's no need for drilling, boring, or hole-sawing. And that's where you save production time, increase machine capacity, and avoid scrap losses!

Crucible's famous tool steel grades are available to you in hollow form, in almost any combination of OD, ID and length. In fact, your local Crucible warehouse can give you immediate delivery of these popular grades — KETOS oil-hardening, SANDERSON water-hardening, AIRDI 150 air-hardening, and NU DIE V hot-work tool steels.

Ask your local Crucible representative how you can save time and money by using Crucible Hollow Tool Steel Bars. Call him today, at our nearby Branch Office. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

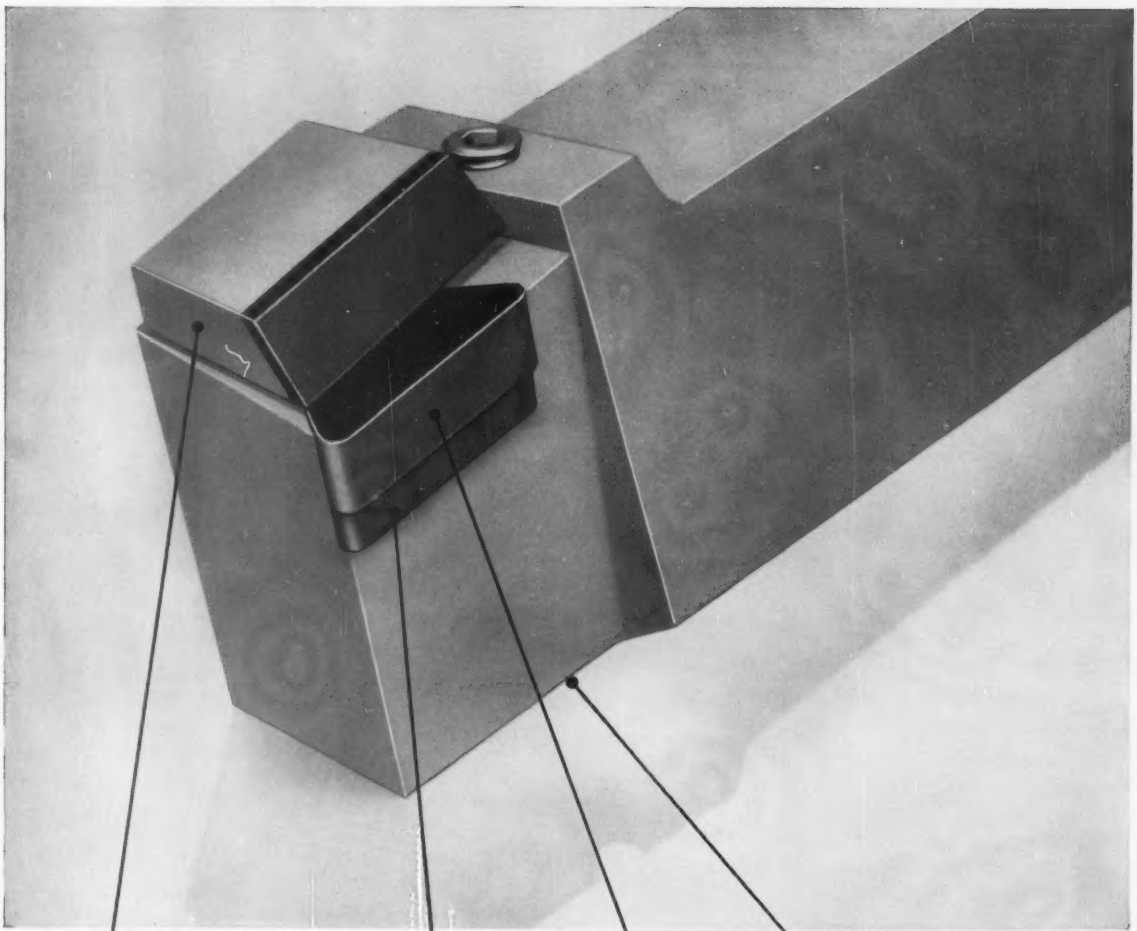
Visit us at Booths 830-832 Production Engineering Show, September 6-16, Navy Pier, Chicago.

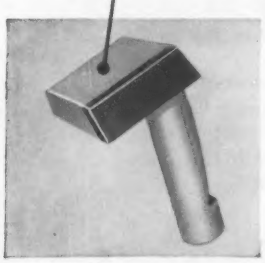
CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Carboloy announces

THE FIRST SIMPLE-TO-USE

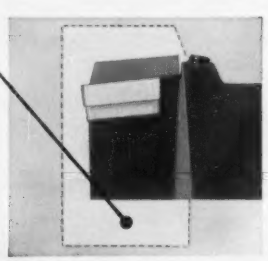




Clamp has built-in, wear-resistant carbide chip-breaker. Requires only light finger pressure to tighten; assures uniform chips, regardless of cut.

Indexable carbide pad is screwed to shank. Stays put while blank is indexed. Absorbs shock; decreases the possibility of holder damage.

Holders available for round, square, or triangular inserts. Expanded line of precision and utility blanks handle any machining job.



Unique design eliminates "club" below shank; reduces overhang to absolute minimum. Indexing is fastest, simplest ever, cuts changing time.

TOOLHOLDERS

- **Single adjustment screw indexes throwaway insert, sets chipbreaker . . . right in the machine**
- **Entirely new design reduces overhang, prevents chip interference, provides greater rigidity**
- **Carbide pad protects shank by absorbing shocks**
- **Heat-treated shank resists bending, deformation**

Exclusive clamping arrangement means you can index the blank, or turn it over – right in the machine – by simply adjusting a single screw at the top of the shank. The carbide chipbreaker is automatically set in the correct position.

Carbide pad cuts insert costs

The carbide pad allows more effective use of thin – and more economical – blanks. It gives greater rigidity; lets you use a harder grade of carbide, at greater speeds and feeds, to increase machine output at no extra cost.

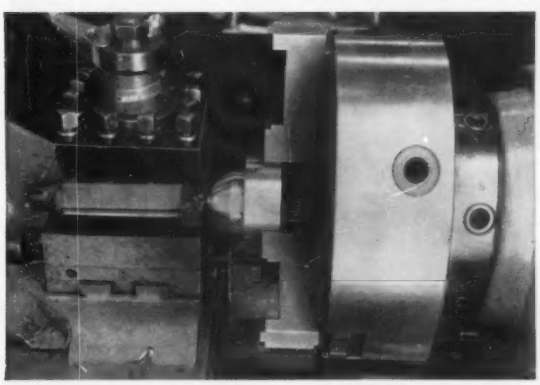
Exclusive Carboloy holder design has no projection below the shank, keeping overhang at a minimum and providing greater rigidity and accuracy. Minimum projection above the shank prevents chip interference and minimizes danger to clamp from flying chips.

Heat-treated shank gives the holder extra strength to resist deformation from clamp screw, and wear from chips.

Versatile holder design

This design is quickly adaptable to "specials" with cutting angles other than standard, to positive or neutral rakes. Also, it is especially adaptable for gang tooling.

The new holder is stocked in seven styles and 52 sizes – paralleling the styles and sizes of Carboloy braze-type tools. For complete details on these easy-to-use toolholders, send coupon today.



TYPICAL TOOLHOLDER APPLICATION

CONTOURING STELLITE VALVE. Round Carboloy insert is furnished precision-ground, eliminating costly grinding operation required for braze-type tools. Inserts on new Carboloy toolholder are indexed or turned over, right in the machine, reducing downtime. With Carboloy holders, only inserts are stocked, saving valuable toolroom space.

MAIL THIS COUPON TODAY

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11147 E. 8 Mile Ave., Detroit 32, Michigan

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

Please send me more information on the easy-to-use Carboloy Toolholders.

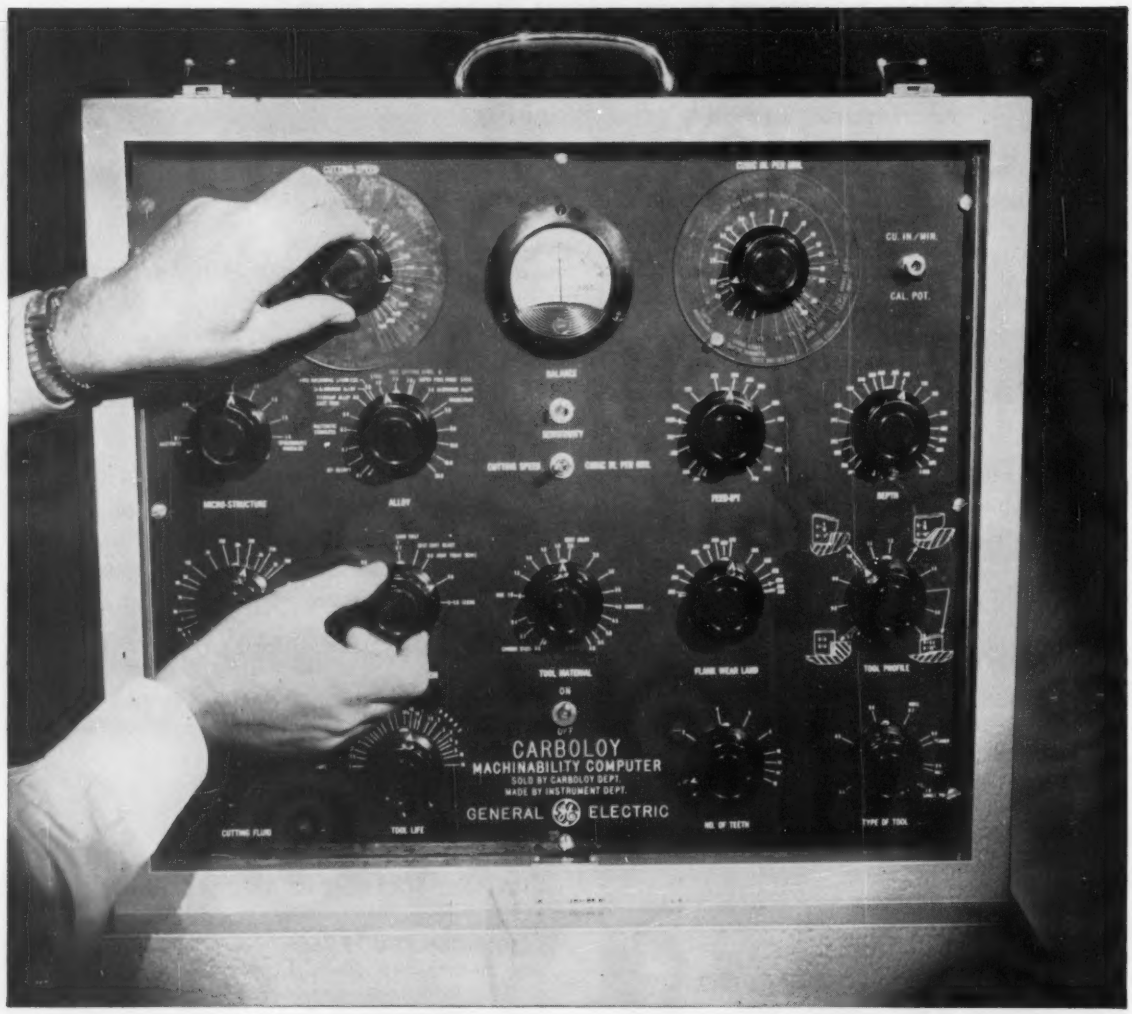
Name_____

Company_____ Title_____

Address_____

City_____ Zone_____ State_____

Carboloy announces the
CARBOLOY MACHINABILITY



To find an unknown variable like speed, output, or motor horsepower, simply set dials according to known information. Then turn dial of unknown variable until meter (top, center) balances at zero setting. Computer instantly shows what happens when any of the variables listed below are changed.

Computes values for any of these 19 operating variables:

Material Cut:
- Work material
- Microstructure
- Hardness
- Surface condition

Cutting Tool:
- Tool material
- Tool life
- Flank wear land
- Tool profile
- Type of tool
- Number of teeth

Cutting Conditions:
- Cutting fluids
- Feed
- Depth of cut
- Cutting speed
- Motor horsepower
- Cubic inches per minute
- Unit horsepower
- Work diameter
- R.P.M.

COMPUTER

- **New engineering tool solves complex machine setup problems in seconds, instead of hours**
- **Shows how to vary cutting conditions to increase machine, cutting tool, and operator efficiency**

In seconds, the low-cost Carboloy® Machinability Computer calculates the effect of 19 basic machining variables on machine performance, tool life, and output.

In seconds, it shows optimum operating conditions for any metal-cutting job, eliminating wasteful experimental runs.

In seconds, it shows how to improve existing setups by the right variation of operating conditions.

Easy to use

The Carboloy Machinability Computer is easy to operate. Anyone with machining experience can use it after a short familiarization period.

Results are numerical – requiring no further interpretation from the direct-reading dials. Accuracy is assured – based on more than a year's testing on in-plant applications at key General Electric plants.

Handles many jobs

The Carboloy Machinability Computer handles basic information on operating conditions, type and condition of work material, style and material of tools. The computer accurately predicts cubic inches per minute removed, tool life, and required machine horsepower. It shows how changing speed, feed, depth of cut, or tool material will affect these and other variables.

The Computer solves – in seconds – problems that would be otherwise impractical because of the large number of machining variables involved.

The Carboloy Machinability Computer was developed and proved in the field by a team of Carboloy and General Electric engineers, under the direction of Dr. W. W. Gilbert, of G.E.'s Manufacturing Services Division.

The Computer is portable (weighs only 32 lbs.), battery-operated, and measures 21″ x 7″ x 20″.

The price of the Carboloy Machinability Computer is ... **$495.** (f.o.b. factory, Detroit)

Whether your plant is large or small, the Computer can bring you immediate benefits. Send the coupon, below, for complete information.

TYPICAL IN-PLANT COMPUTER APPLICATION

PROBLEM: Setting up 16″, 10-HP lathe to turn hot-rolled 1020 steel bar with 10″ diameter, to get tool life of 1 hour.

SOLUTION: Starting from scratch on a new setup, *days* could be used by experienced tool men to find a satisfactory set of operating conditions . . . with no assurance that the result would be the best possible. With the computer, the optimum setup was established, and the effect of changing key variables compared, in less than *15 minutes.*

BENEFITS: Computer turned lengthy setup time into valuable production time. On this job alone, the savings gained through days of extra production, plus savings in manpower costs, would more than equal the cost of the computer.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11147 E. 8 Mile Ave., Detroit 32, Michigan

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

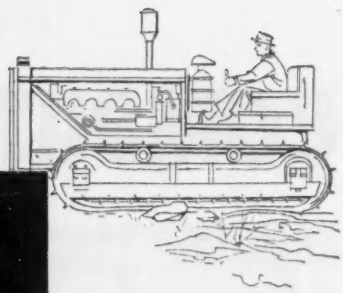
Please send me more information on the Carboloy Machinability Computer.

Name_____

Company_____ Title_____

Address_____

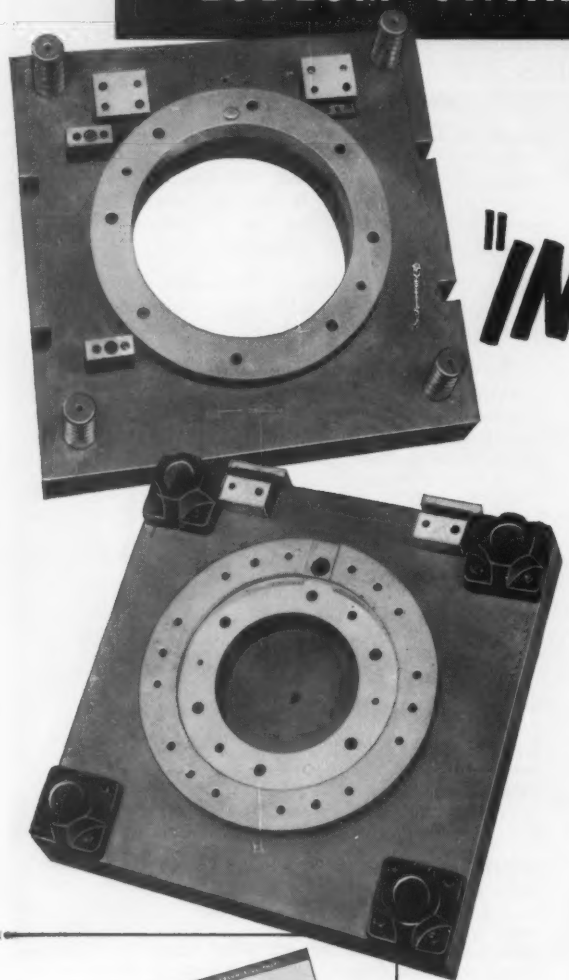
City_____ Zone_____ State_____



LUDLUM ONTARIO DIE

comes through

"IN THE CLUTCH"

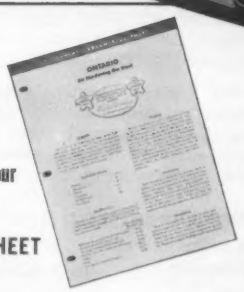


A NATIONALLY KNOWN TRACTOR COMPANY used Ludlum ONTARIO dies to help reduce production costs. Ontario was given the job of blanking clutch plates from *high carbon* hot rolled steel .084" to .098" thick and 13½" wide.

EACH ONTARIO DIE BLANKED 220,000 clutch plates a year with only 11 resharpenings for an average of 20,000 pieces per grind!

AIR HARDENING ONTARIO PROVED IDEAL for this application because of its high abrasion resistance, high hardness and excellent non-deforming properties. It is tougher and easier to machine than higher carbon-high chromium types which are normally oil hardening.

ALLEGHENY LUDLUM METALLURGISTS can help solve your tool and die steel problems. Call your local A-L representative or distributor today . . . or write *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.*



Write for your ONTARIO BLUE SHEET

This four page report discusses properties and characteristics of Ontario. It includes complete information on forging, annealing, tempering, etc. and detailed laboratory data on physical characteristics. *Ask for your free copy.*

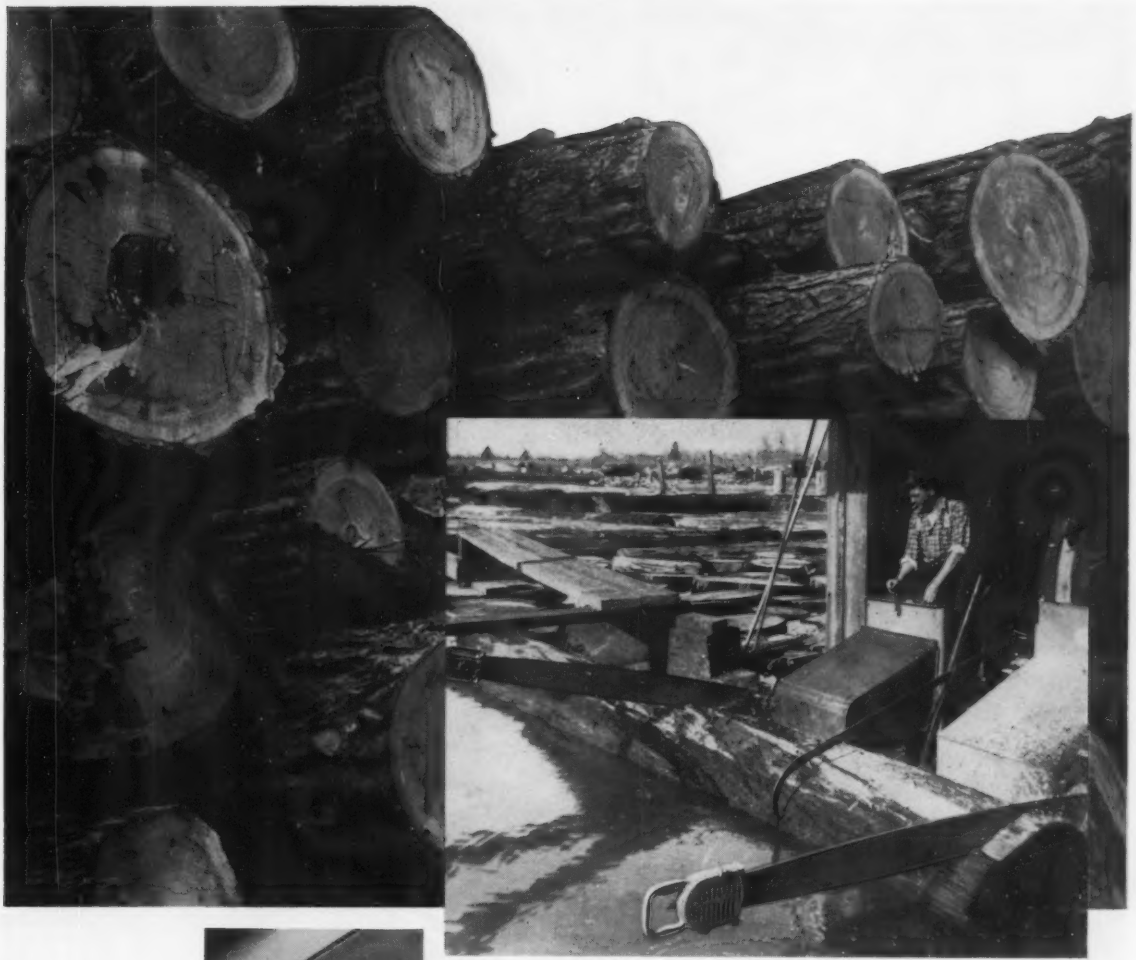
Address Dept. M-70

For complete MODERN Tooling, call

Allegheny Ludlum

W&D 5331

AL® FINE TOOL STEELS SINCE 1854



▲ L-M pond-type chain saws "bucking" log for a veneer plant.

◀ Close-up of MAX-EL alloy steel chain saw bar, showing depth of heat treatment for tougher, longer-lasting bars.

it takes MAX-EL Alloy Steel to take a beating like this

Ram the flying teeth of a chain saw against a heavy log — and watch the sawdust fly! But don't forget — backing up that speeding chain is a bar that has to absorb all the shock . . . yet keep the chain lined up accurately, dependably.

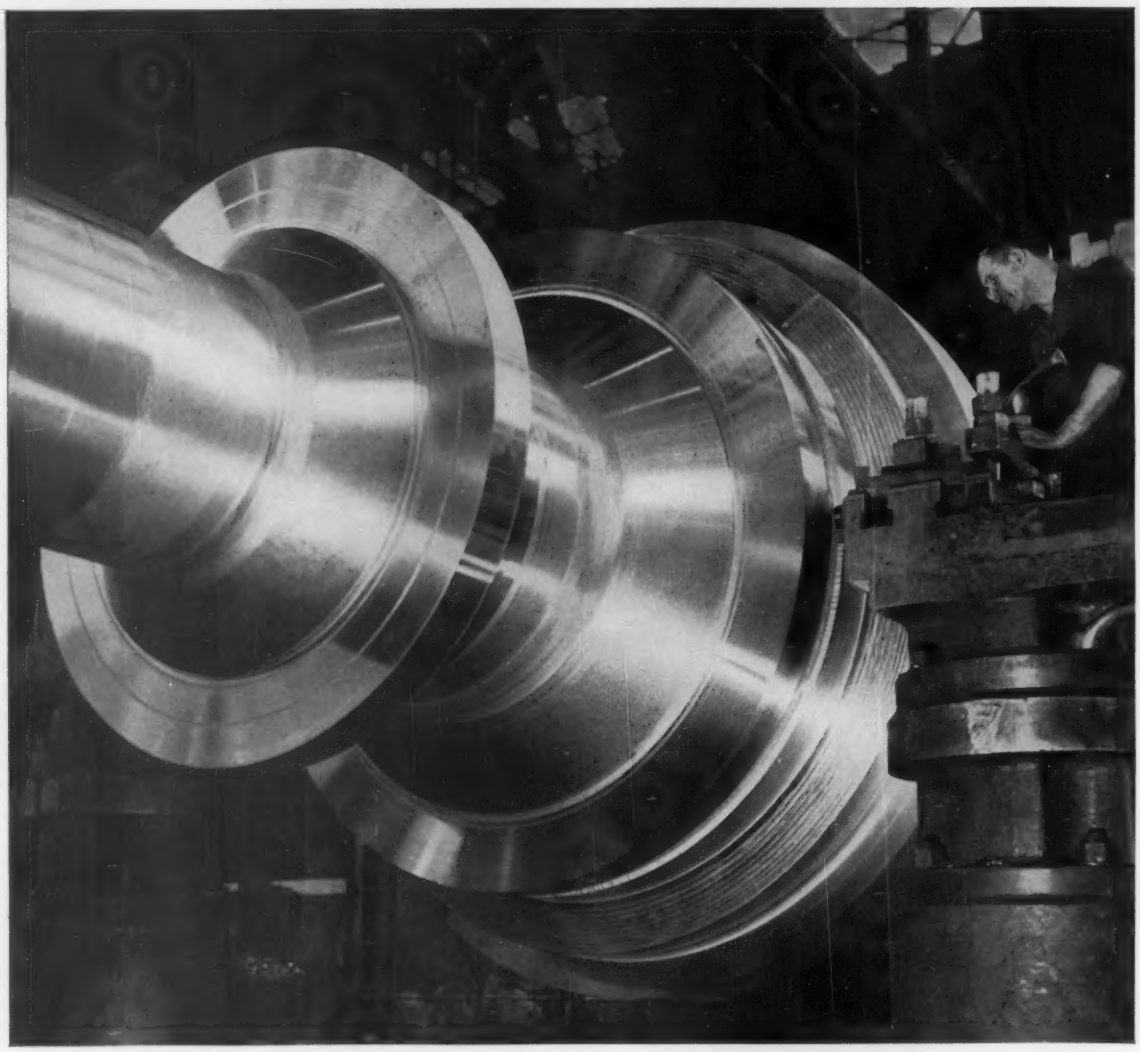
That's a big reason why leading chain saw manufacturers, like L-M Equipment Company, Portland, Oregon, specify Crucible MAX-EL® alloy steel for chain saw bars.

And there are other reasons, too. For MAX-EL is not only tough, wear-resistant and dependable . . . but it also shows outstanding response to heat treatment . . . excellent machinability . . . high uniformity . . . minimum distortion. It's these qualities that permit L-M to machine their saw bars first — *then* give them a graduated heat treatment that insures toughness at the edges . . . flexibility in the main section.

If your product requires a tough, machinable, nondeforming alloy steel — MAX-EL is for you. Try it. To see what information is available on MAX-EL — or *any* Crucible special steel — get your copy of the "Crucible Publication Catalog." Write *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America



One of Three for Gavins Point

This huge forged shaft is one of a trio built by Bethlehem for the hydroelectric installation at Gavins Point Dam, South Dakota. There a $70,000,000 power and flood-control project will harness the great Missouri and make of its turbulent waters a useful and willing servant.

The shaft as you see it in the photograph is being rough-machined. Of carbon-vanadium steel, it weighs about 61 tons—proving that the picture is no optical illusion. The job is a big one by any standard. That largest flange is more than 8 ft across, and the overall length of the shaft is 22 ft 4 in.

This is the kind of forging that people so often associate with Bethlehem. Our steel-making, forging, treating, and machining facilities are *always* geared to handle big-tonnage jobs. But we are equally interested in smaller items. Actually, small and medium forgings are an important part of our business, and these receive the same exacting care as the king-size pieces.

So check with us . . . whether your need is for tiny drop forgings or giant columns or shafts weighing a hundred tons and up. Your inquiries will be given prompt attention.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Do you need answers to these questions?

1. **How can I electroclean steel at lower cost?**
2. **How can I find a brass cleaner that gives better protection against tarnishing?**
3. **How can I reduce rejects due to faulty electrocleaning of zinc die castings?**

Answer 1: Following an Oakite recommendation, one plater made a small change in his steel-cleaning cycle and soon had two tankfuls of cleaning solution doing the work of three—and the plate adhesion was improved. *See booklet offered below.*

Answer 2: Oakite has a new brass cleaner that provides scientific protection against the oxygen that tarnishes brass and other copper alloys during the application of reverse current. *See booklet offered below.*

Answer 3: Oakite has an anodic conditioner that offers brighter plating of zinc die castings . . . with no anodic blackening and fewer rejects. *See booklet offered below.*

FREE For more information about the electrocleaning of steel, brass or zinc die castings, send for one or all of the booklets listed in the coupon.

OAKITE PRODUCTS, INC.
26 Rector Street, New York 6, N. Y.

Send me the free booklets I have checked below:

- ☐ "Four good steps toward better electroplating on steel"
- ☐ "What's new for electrocleaning brass and other copper alloys"
- ☐ "Good news about electrocleaning zinc-base die castings"

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE
SCIENCE

Name_____

Company_____

Address_____

Technical Service Representatives in Principal Cities of U. S. and Canada

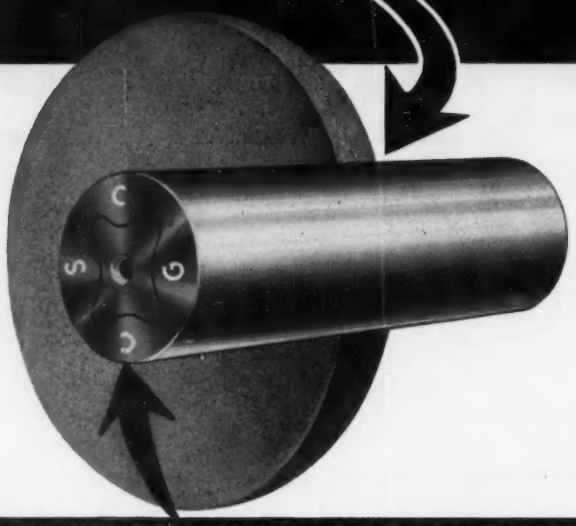
Export Division Cable Address: Oakite

An exclusive GRINDING PROCESS...

makes

CUMBERLAND STEEL BARS

concentric, straight, smooth & *really* accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002″ on diameters 1-1/8″ to 2-7/16″ inclusive . . . plus nothing to minus .003″ on diameters 2-1/2″ to 8″ inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is *carefully tested* before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

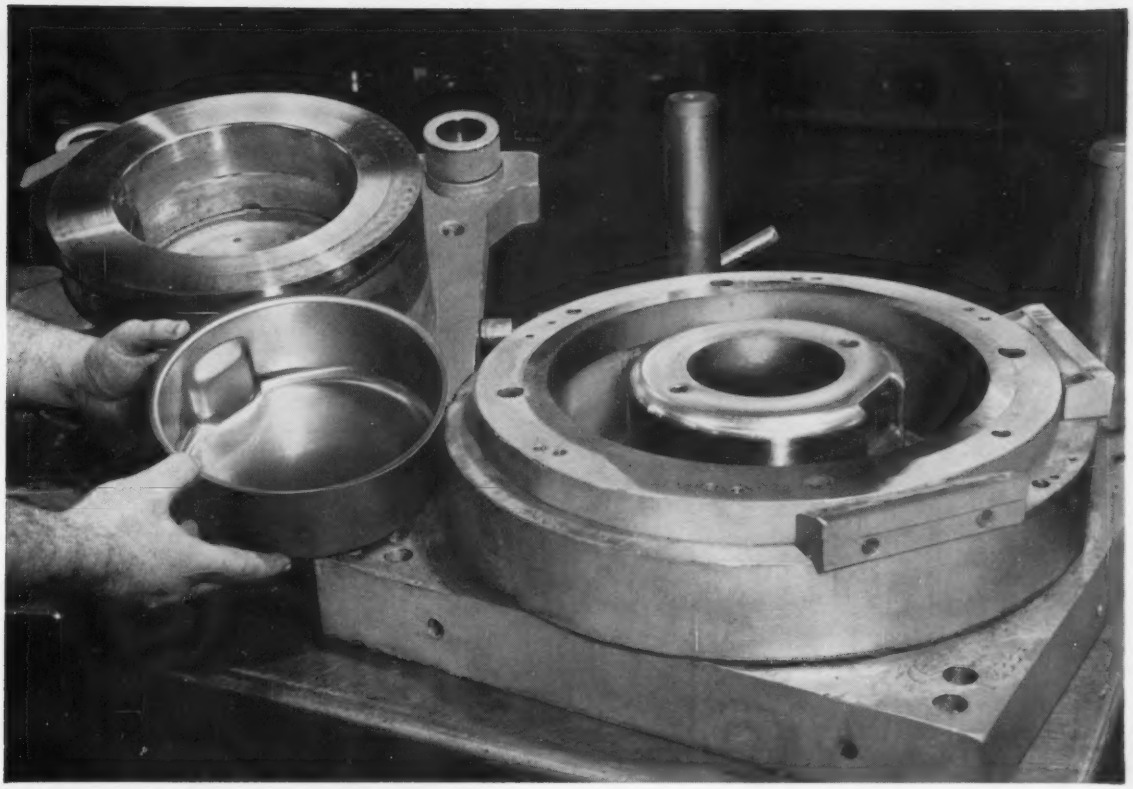
MANUFACTURED IN THREE SPECIFICATIONS

Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min.
Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.
Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

ESTABLISHED 1845 **INCORPORATED 1892**



General Electric Department keeps blank and deep draw rejects under 3% with Graph-Mo® tool steel die

AIR chambers for General Electric Swivel Top Cleaners require a 3⅛″ deep draw. Yet they have to be stamped out rapidly with a minimum of rejects to keep up with production requirements. General Electric Vacuum Cleaner Department in Cleveland, Ohio, turns out an average of 333 air chambers per hour with less than 3% rejects by using a Graph-Mo® tool steel die.

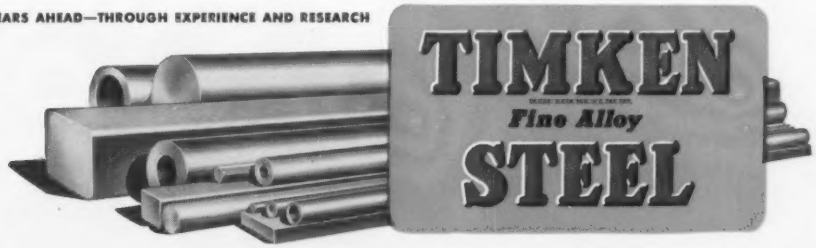
Rejects are held down because Graph-Mo tool steel has a unique structure, diamond-hard carbides, plus unusual ability to retain lubricants on the wearing surface. This prevents excessive scuffing and galling even in tough draws like this.

Result: The Graph-Mo steel die wears extremely well. Many users report that Graph-Mo steel outwears other tool steels 3 to 1.

Machining is fast because Graph-Mo steel machines 30% easier than conventional tool steels. And it has uniform response to heat treatment, completely eliminating distortion.

Graph-Mo is only one of four graphitic tool steels developed by the Timken Company. For more information about all of their uses in dies, punches, gages and machine parts, send for the new 10th edition of "Timken Graphitic Steel Data Book". Write to: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

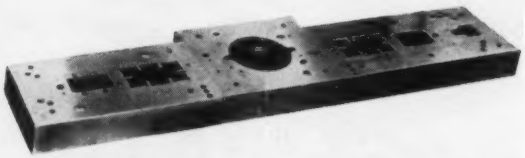
YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

How to Know BEFORE DELIVERY

What Results You'll Get from the TOOL AND DIE STEELS You Order



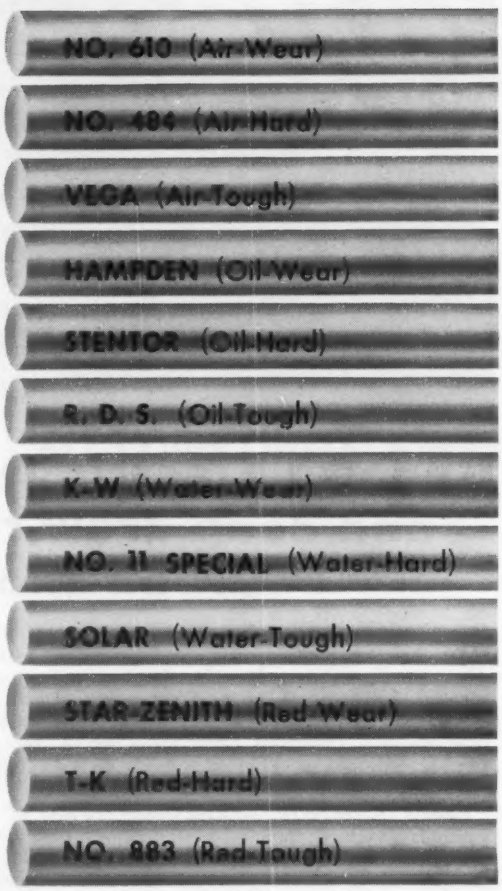
Maximum performance from your tools and dies is possible *only* when your design, toolmaking and heat treating are backed by sound, top quality tool and die steels. You control the first *three factors*. But how can you be sure, *before delivery*, that the die steels you order will deliver the *results* you want?

To give you this assurance, Carpenter puts its "mark" on *every* grade of die steel it produces. This mark, or brand name, is the sign of *consistent Carpenter quality*.

In back of it, at Carpenter, is a long list of painstaking controls. These include Hot Acid Etch Inspection, Ultrasonic Testing, Tough Timbre and Hardenability Testing. And that's only the start of many *extras* you get with Carpenter brands of tool and die steels . . . extras that enable you to predict *in advance* results you'll get on the job!

Accurate selection is one example. With the Carpenter-pioneered Matched Set Method your men take the guesswork from choosing the one steel best suited to the job. *Trouble-free heat treating* is another. Through tests and controls, Carpenter has simplified the heat treatment of Matched Tool and Die Steels beyond anything previously known. Further, a wealth of printed information gives you a "blueprint" to minimize costly heat treating hazards.

All this . . . and more, stands behind every bar of Carpenter Matched Tool and Die Steel. So, when you see any of these Carpenter brand names, you can feel *safe* in the knowledge you're getting *full value* from your investment. Specify Carpenter Matched Tool and Die Steels. It costs you no more to be *sure!*



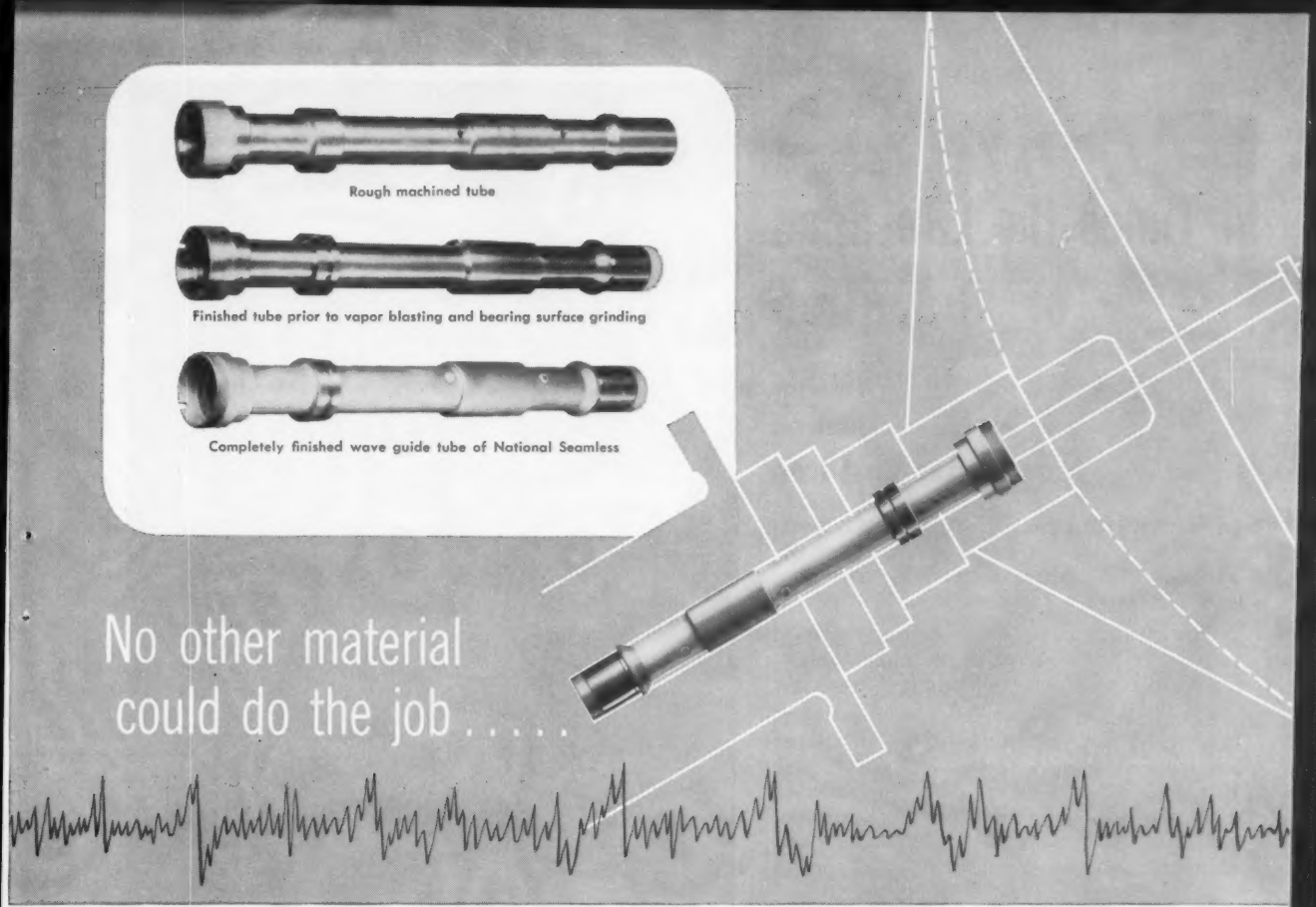
And each bar is colored *full length* with a distinctive color for each grade. Here's *positive* identification!

Carpenter STEEL

Matched Tool and Die Steels

Export Department: The Carpenter Steel Co., Port Washington, N.Y.—"CARSTEELCO"
THE CARPENTER STEEL CO., 105 W. Bern St., Reading, Pa.
Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U.S.A. and Canada

For more information on products advertised, use Inquiry Card, page 243


Rough machined tube
Finished tube prior to vapor blasting and bearing surface grinding
Completely finished wave guide tube of National Seamless
No other material
could do the job . . . . .

National Seamless Tubes of USS Stainless Steel chosen for Radar Scanner Wave Guide Tube

The wave guide tube, along with the rotor control, form the central control unit of the Radar Antenna System designed and manufactured by Davis Industries, Inc., of Detroit, Michigan.

Originally, the wave guide tube was manufactured from carbon steel suitably plated to eliminate corrosion. Manufacturing complications and plating difficulties proved this process economically unsound and operationally hazardous. That's why NATIONAL Seamless Tubes of USS Stainless Steel were specified. The 1⅛" I.D., ½" wall seamless USS Stainless Steel tubes offered a clean job that required no plating and solved the corrosion problems. In addition, only seamless steel tubing could meet the weight and strength factors required.

The superior strength, consistent uniformity, and dimensional accuracy of NATIONAL Tube's Seamless Steel Tubing make it ideal for all types of vital applications. It is available in a wide range of diameters, wall thicknesses, various shapes and steel analyses, and is produced to exacting standards by the world's largest manufacturer of tubular steel products. Upon request, our engineers will be glad to make a study of your requirements, and help you apply Seamless Steel Tubing to your particular specifications.

SEE The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

NATIONAL SEAMLESS STEEL TUBES

WALLS WITHOUT WELDS

UNITED STATES STEEL

4 Times the Life-Span of "Gray" Iron

Harnischfeger gets longer life and easier fabrication from Ductile Cast Iron

In solving a machining problem, Harnischfeger Corporation discovered how to greatly increase life of sheaves handling wire rope on their overhead cranes.

The problem arose in machining sheaves of gray cast iron. Chill at the top and corners of rope grooves caused cutting tool breakage.

When Harnischfeger annealed these castings to improve machinability, the base or bottom of the rope grooves were softened. Ranging from 140 to 196 BHN, the softened grooves wore out prematurely and frequent replacements were needed . . . wasting valuable hours of production time.

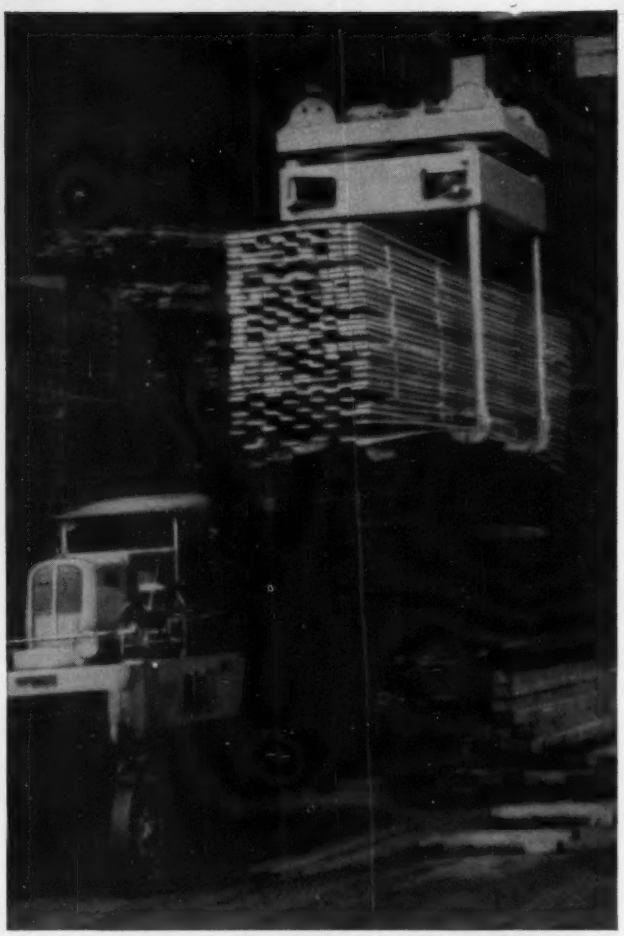
Ductile Cast Iron the answer

Ductile iron, which has excellent wear resistance, solved the problem.

Although the hardness of the Ductile Cast Iron was higher (240-269 BHN) than that of cast iron, it was free of chill at the edges and machined readily. But especially important in handling wire rope, the wear resistance provided by Ductile Cast Iron gave the sheaves a 4 to 1 longer life than gray iron.

This is a simple example, showing how you get multiple savings by using Ductile Cast Iron. For here's a material with the castability of cast iron, and properties similar to those of cast steel.

Get all the facts about the impact strength, wear resistance and machinability of this economical cast iron. It's several times stronger and tougher than gray cast iron. Send for a copy of "DUCTILE IRON, The Cast Iron THAT CAN BE BENT!" It's filled with helpful data. Write for your copy now.



Way to cut downtime of overhead traveling crane. Grapple shown at work in lumber shed is equipped with sheaves of Ductile Cast Iron. Readily machinable, but resistant to wear from wire rope, they outlast gray iron sheaves 4 to 1. Equipment produced by Harnischfeger Corp., Milwaukee 46, Wisc.

DUCTILE IRON

ductile iron . . . the cast iron that can be twisted and bent

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N. Y.

For more information on products advertised, use Inquiry Card, page 243

Tool Steel Topics

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

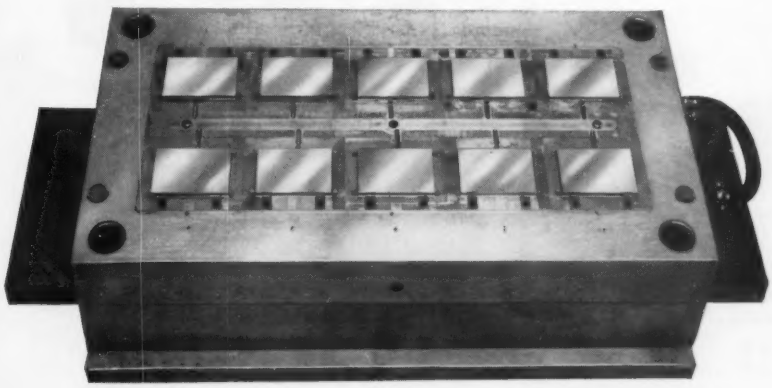
PLASTIC BOXES BY THE MILLIONS WITH Dies of BTR

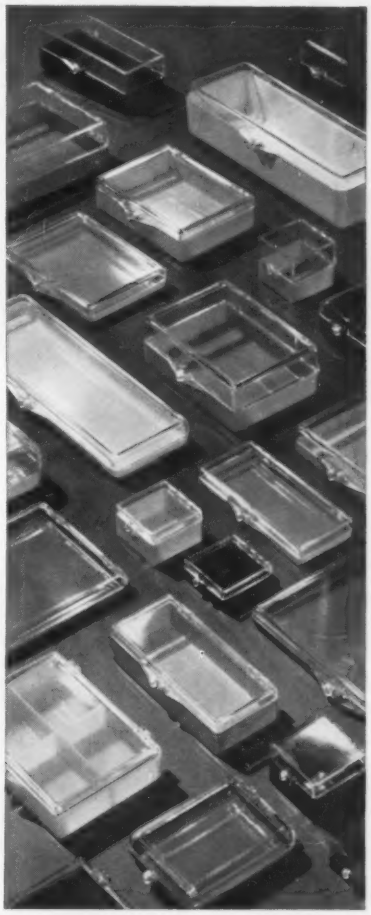
This die, made of BTR (Bethlehem Tool Room) tool steel, is typical of the dies used by Hake Manufacturing Co., Inc., Roanoke, Va., makers of plastic boxes. The die is used in injection molding of plastic parts of polystyrene, the BTR being used for the die-cavity, cores and runners.

The die is hardened to Rockwell C 56-58. The cores and cavities in the molds are highly polished to a rich, mirror-like finish, to provide a smooth, glossy surface on the completed product.

BTR is our general-purpose, manganese-chromium-tungsten grade of oil-hardening tool steel. It is economical for plastic-molding because it is easy to machine, and has a long service life. BTR can also be polished to a high surface lustre, which it retains indefinitely.

To place a trial order for BTR, or if you would like to have additional information about this fine tool steel, just call your tool-steel distributor.





4 Big Advantages with Red Sabre Tool Bits

Talk about economy! With Red Sabre Tool Bits, you get fast cutting, smooth surfaces, fewer grinds, and more metal removed per dollar. Red Sabre is a high-speed steel containing approximately 1.50 carbon, 12.00 tungsten, 5.00 vanadium, and 5.00 cobalt. That means high red-hardness and surface-hardness for unusual resistance to surface wear, and for maximum cutting ability. Besides, Red Sabre Tool Bits are hardened to Rockwell C 65. They are a good buy, always!

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Billets Are Billets (Not Bars)

"Billets are billets" is a truism similar to "Pigs is pigs," and is just as appropriate. A tool steel billet is a semi-finished product intended for use by forging to desired size. It is definitely not intended to be used to make tools by machining, as is bar stock.

This distinction may seem like hair-splitting, particularly if you have already machined tools directly from billets (when the correct bar size was not available) without encountering trouble. Although trouble does not develop every time billets are used in this manner, machining still remains an incorrect procedure, and should always be avoided.

WHY ZINC RATES FIRST IN DIE CASTING • NUMBER 5 OF A SERIES

fine appearance as demanded by SCHICK
INCORPORATED

The brand-new Schick "25" electric shaver, commemorating Schick's Silver Jubilee, not only is claimed to be a completely new concept in electric shaving, but demonstrates the outstanding results of the latest techniques in precision product engineering. The "business end" of the palm-sized new "25" is composed essentially of the four ZINC die castings illustrated above. When chromium plated, these metal components contrast beautifully with the gleaming white plastic housing.

The ZINC die castings are shown as they are received by Schick from the die caster. Not only are all assembly elements accurately cast, but the design details (note the raised trade mark and the recessed lettering on the nameplate) are sharply defined. *No machining is required* and, since the castings are ZINC, standard plating procedures are used. The right and left hand "whisk-its" (which snap open for easy cleaning) and the shearing head divider are bright chrome. The nameplate is finished in a soft silvery satin with the recessed lettering painted black to provide quick product identification.

Appearance is just one of many considerations which dictate the choice of ZINC die castings in product engineering. Send for our brochure and contact any commercial die caster for the answers to your particular production problems.

The New Jersey Zinc Company, 160 Front Street, New York 38, N. Y.

ZINC
FOR DIE CASTING ALLOYS

The Research was done, the Alloys were developed, and most Die Castings are based on
HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC

For more information on products advertised, use Inquiry Card, page 243

Let New Britain engineering supply a new approach

A machine is listed as an asset on your balance sheet, but if it slows your production and makes your costs too high, it's an asset you can't afford.

We invite you to call in your New Britain representative for a new approach to turning out the pieces that affect your profit margins. He has one of the broadest lines in the industry to choose from.

The following four pages contain examples of New Britain's New Approach.

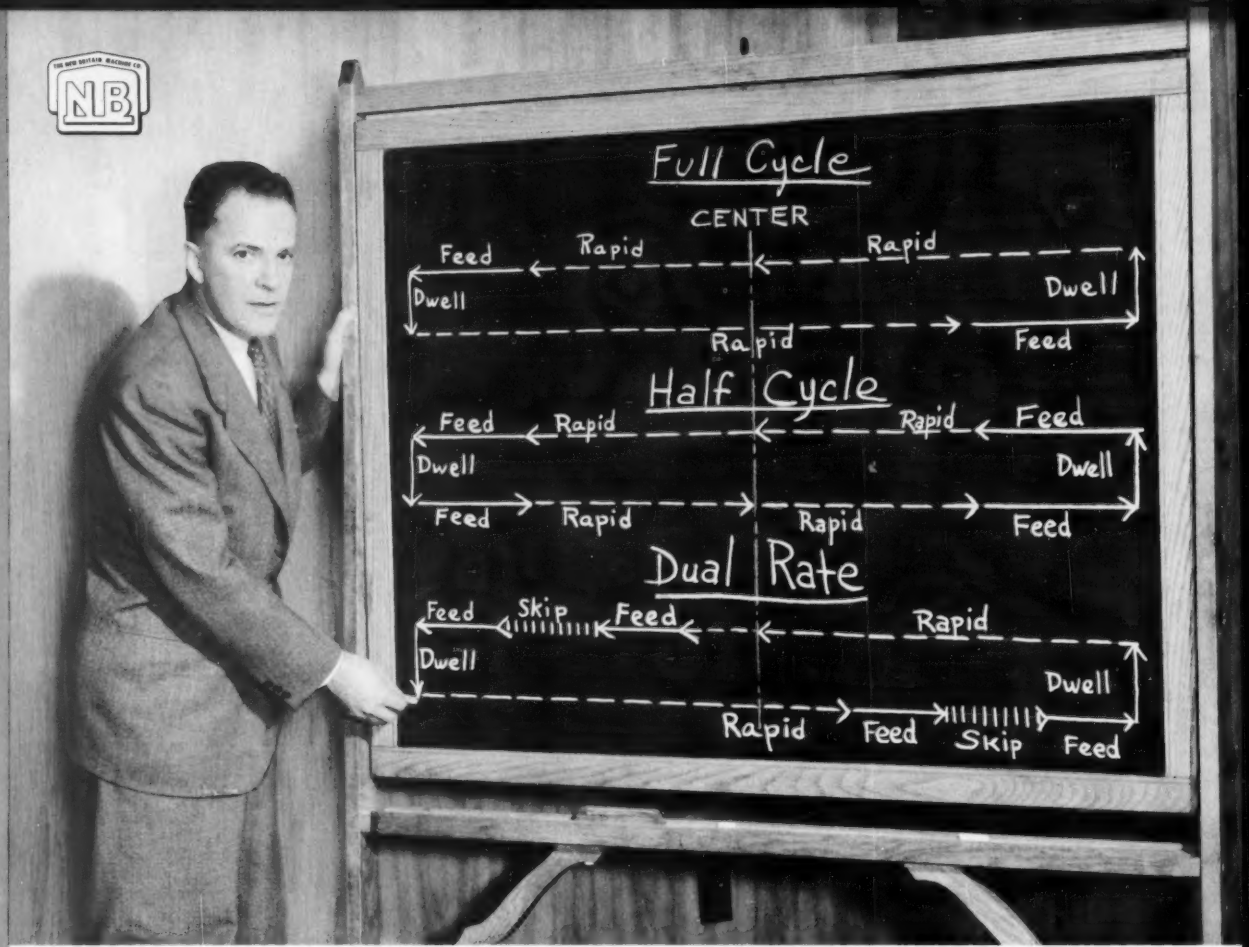
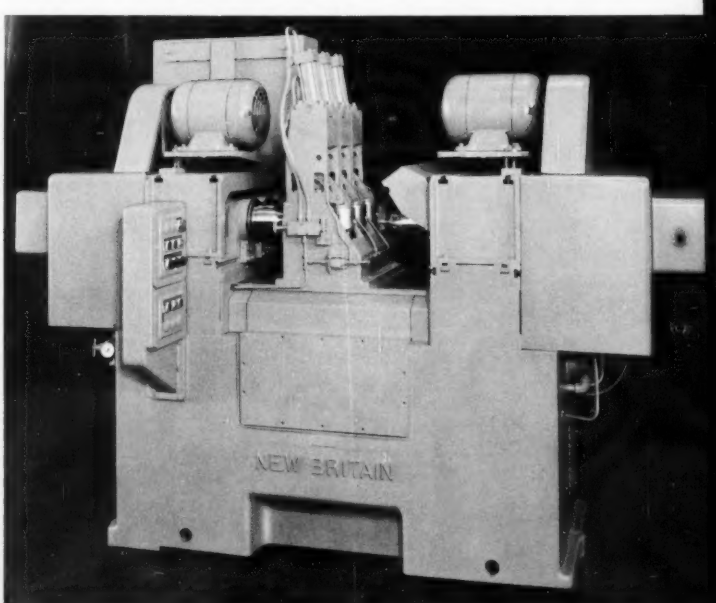


Diagram of versatility

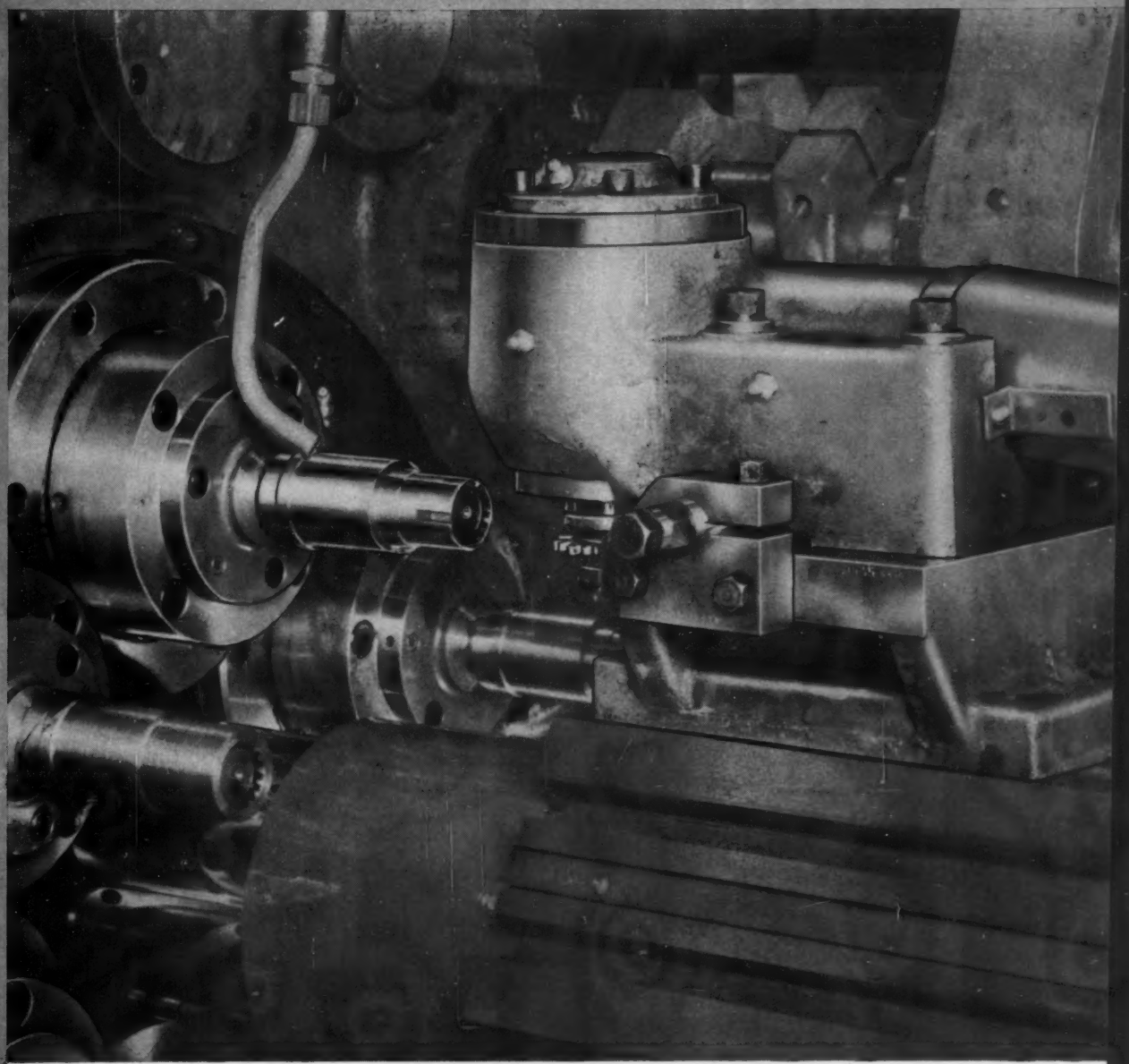
New Britain engineers can show you how to get two pieces per cycle (or double-end production) because of the flexibility of cycling they have designed into our double-end precision boring machines. The blackboard sketches show only three of many set-up possibilities.

FEATURES:

- **Completely separate hydraulic unit outside machine frame**
- **Automatic re-cycling or manual operation**
- **New Britain precision boring spindles**
- **Variable feed during cutting cycles**
- **Special fixtures and work holding devices**
- **One to four spindles at each end**
- **Tool or work rotating**
- **Coolants (optional)**



Model 50 New Britain Double-end Precision Boring Machine



The best machine is only as good as the engineer who tools it

How imaginative tooling can save time and money

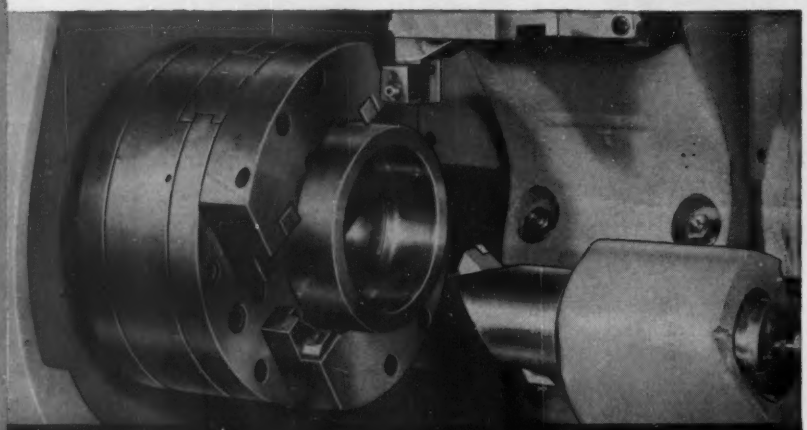
Skillful application of engineering principles to perform secondary operations on one machine can work wonders on *cost-per-piece:* Compare the cost of this milling attachment with the cost of a separate milling machine, *plus operator, plus overhead, plus maintenance, plus transfer time.*

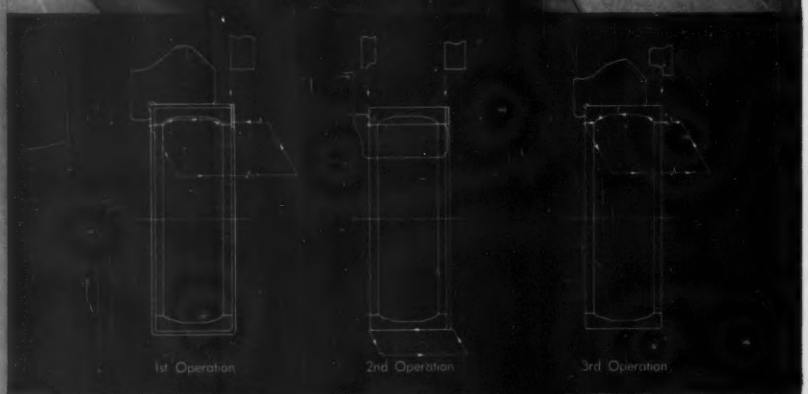
Opportunities like this for lower cost-per-piece exist in almost every plant, if you look for them. New Britain engineers are trained specialists, ready to cooperate in finding better methods.

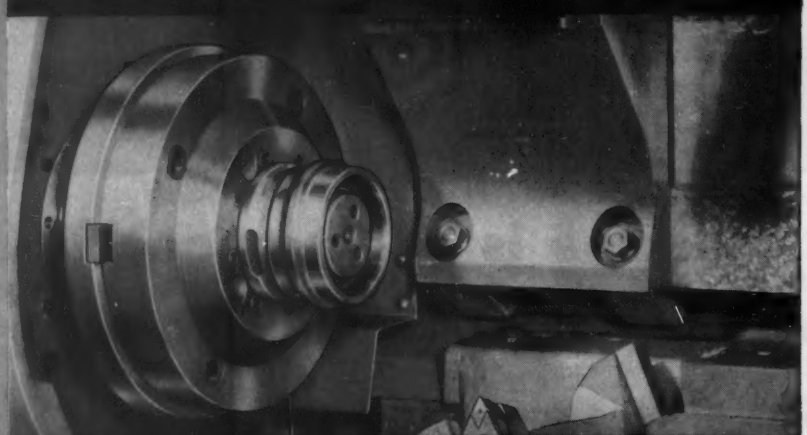
See preceding two pages and two following pages for other New Britain New's.

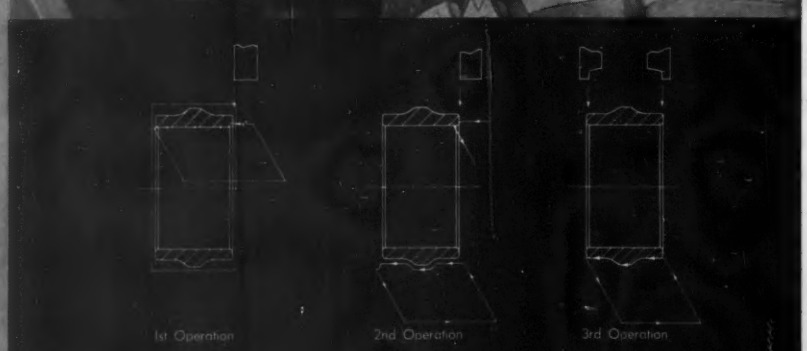
New approach to bearing races

Single point turning on a New Britain +GF+ copying lathe









- **Three New Britain +GF+ lathes replace four other machines**
- **No costly form tools to buy and maintain**
- **Change-over time reduced 90%**
- **Total job time cut more than 50%**
- **Savings quickly pay for new machines**

Easy way to learn about the New Britain +GF+ copying lathe

Ask your New Britain representative for a showing of the color motion picture "A NEW APPROACH TO COPY TURNING" in your own plant. Or write The New Britain Machine Co., New Britain, Conn.

The NEW BRITAIN

Lucas attachment produces better finish in a fraction of former time

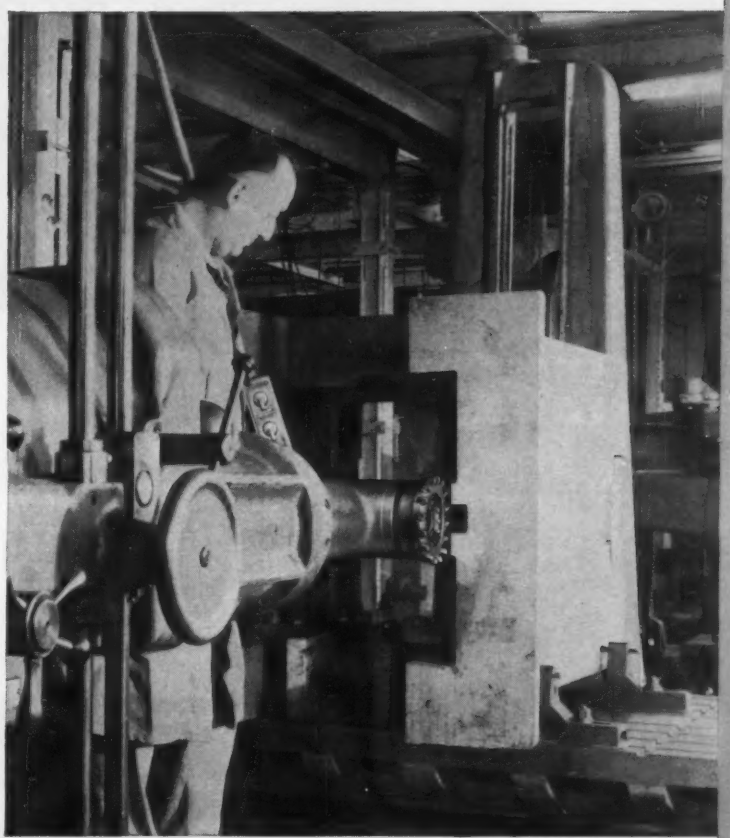
LUCAS OF CLEVELAND

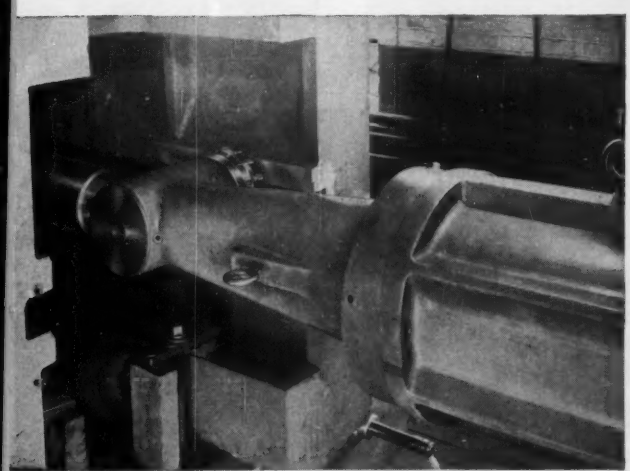
This Lucas Precision Horizontal Boring, Drilling and Milling Machine with angular milling attachment faces two opposing surfaces of this large casting with extreme precision. It machines both sides of the work with a simple 180° repositioning of the cutter — without resetting the job, or loss of accuracy.

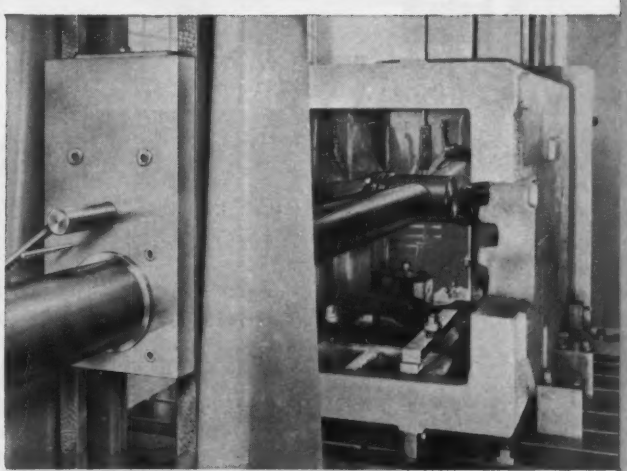
Performing these fine finish operations with the cutter over *four* feet away from the front bearings of the machine is an extreme test, but there is no chatter, and this job has been running for four years to the manufacturer's complete satisfaction.

Ask your Lucas representative for help on the jobs other horizontal boring mills can't handle.

LUCAS MACHINE DIVISION
The New Britain
Machine Company
Cleveland 8, Ohio







• AUTOMATIC BAR and CHUCKING MACHINES • PRECISION BORING MACHINES
• LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES • NEW BRITAIN +GF+ COPYING LATHES

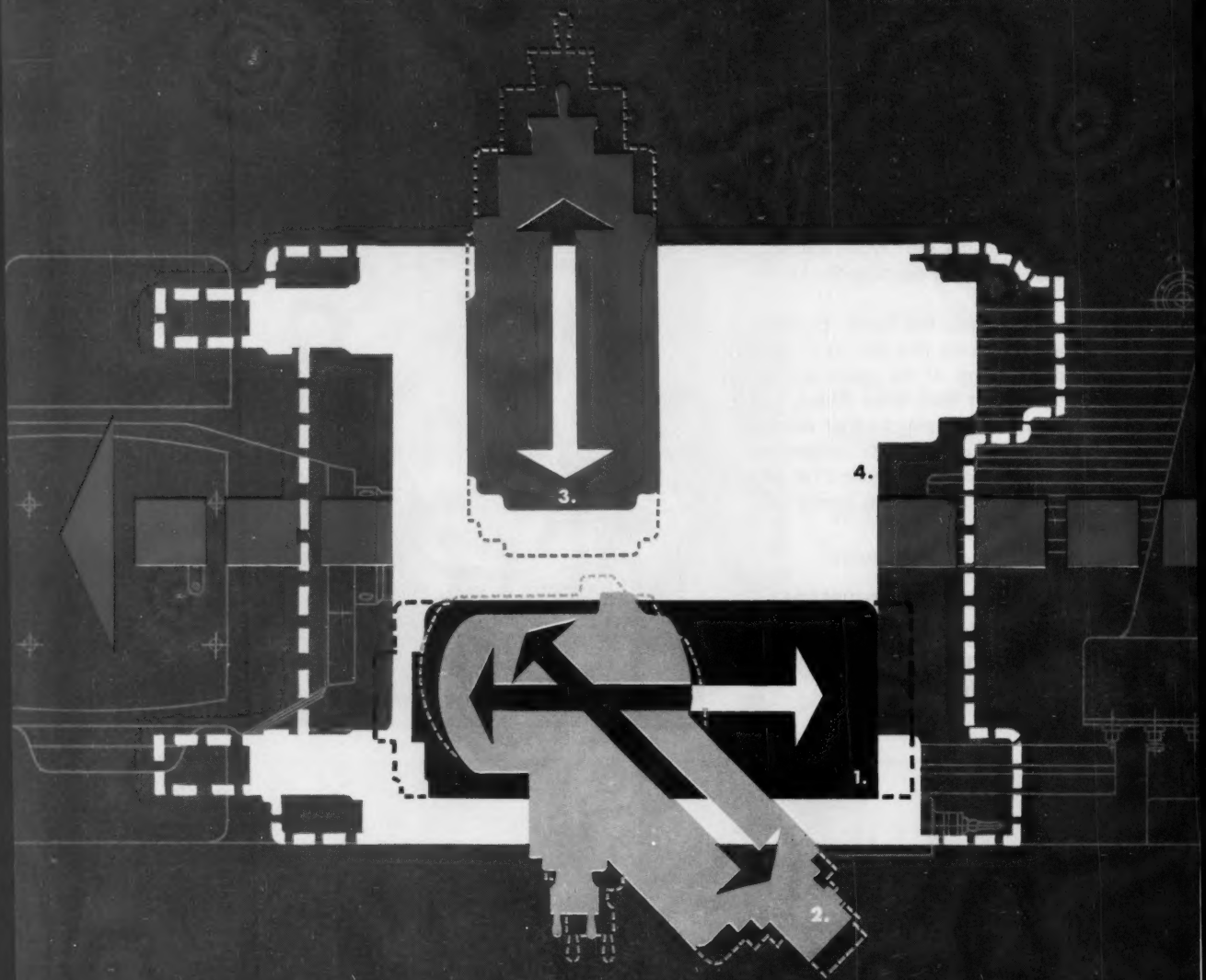
MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut
Lucas Machine Division, Cleveland 8, Ohio

See the preceding four pages for other New Britain *New's*.

ACTION That's the Word for Hydra-Slide!

ARROWS SHOW SLIDE MOVEMENTS OF MONARCH'S NEW AUTOMATIC CYCLE CHUCKING LATHE



1, 2. Basic unit, most models—hydraulically operated front slide unit, on which is mounted famous Monarch Air-Gage Tracer. Utilized generally for straight or contour turning, facing, or boring.

3. Hydraulically operated rear slide unit for necking and grooving—is ideal with proper tool setting for facing, for which hydraulic automatic tool relief is provided.

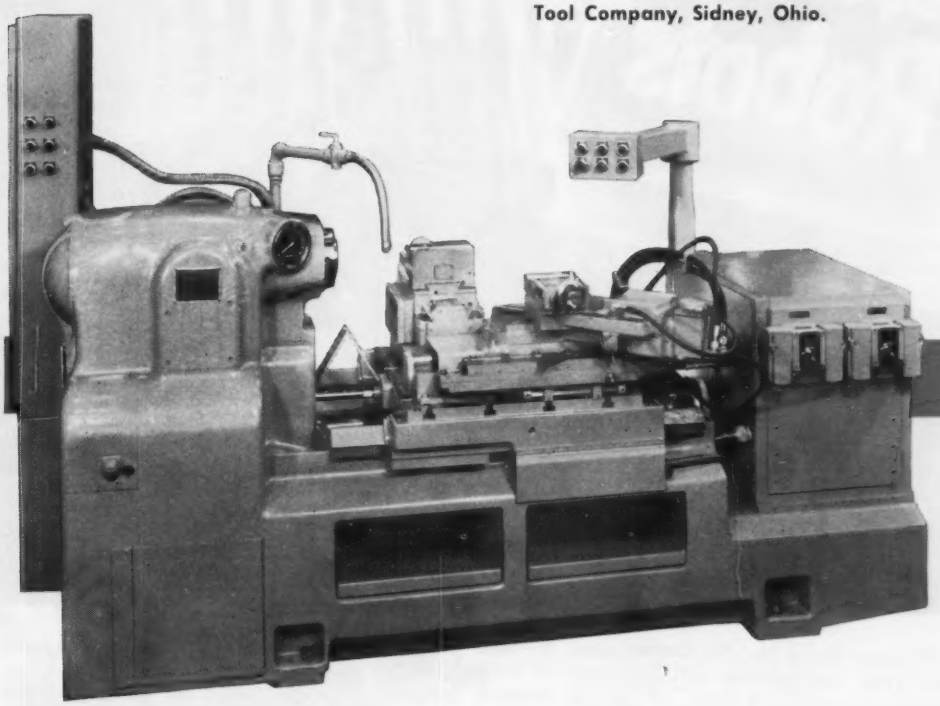
4. Platen with hydraulic movement, on which both front and rear slide units are mounted. Speeds cycle for work piece change!

HERE'S ACTION in the fight against rising production costs—with a fully automatic cycle controlling an extremely effective combination of hydraulic slide movements. Look them over! Here's an exceptionally versatile, high production chucking lathe for both first and second operation work.

Although the typical cycle presumes a tool or tools on both front and rear slides, and is based on the ideal production-wise situation of simultaneous operation of slides—the versatility of the machine is such that many variations can be set up. Of course, there are convenient all-electrical controls for effortless and positive setup.

The Hydra-Slide has ample capacity as to work size and stock removal both, with work diameter capacity up to 15" over front slide unit —up to 13" over rear slide unit—and work drive motor ratings up to 20 H.P.

Here's action—production-wise and cost-wise! You should know *all* about a machine like this. Send the coupon today for our complete illustrated booklet #1703—**The Monarch Machine Tool Company, Sidney, Ohio.**



The Monarch Hydra-Slide. Front Slide, with Air-Gage Tracer, provides smooth, stepless cut for multiple diameters, tapers, faces, radii and chamfers with single-tool economy. One or more tools on rear unit neck, groove, form cut, and face. Both mounted on platen. Send coupon for complete story.

Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

THE MONARCH MACHINE TOOL COMPANY
SIDNEY, OHIO

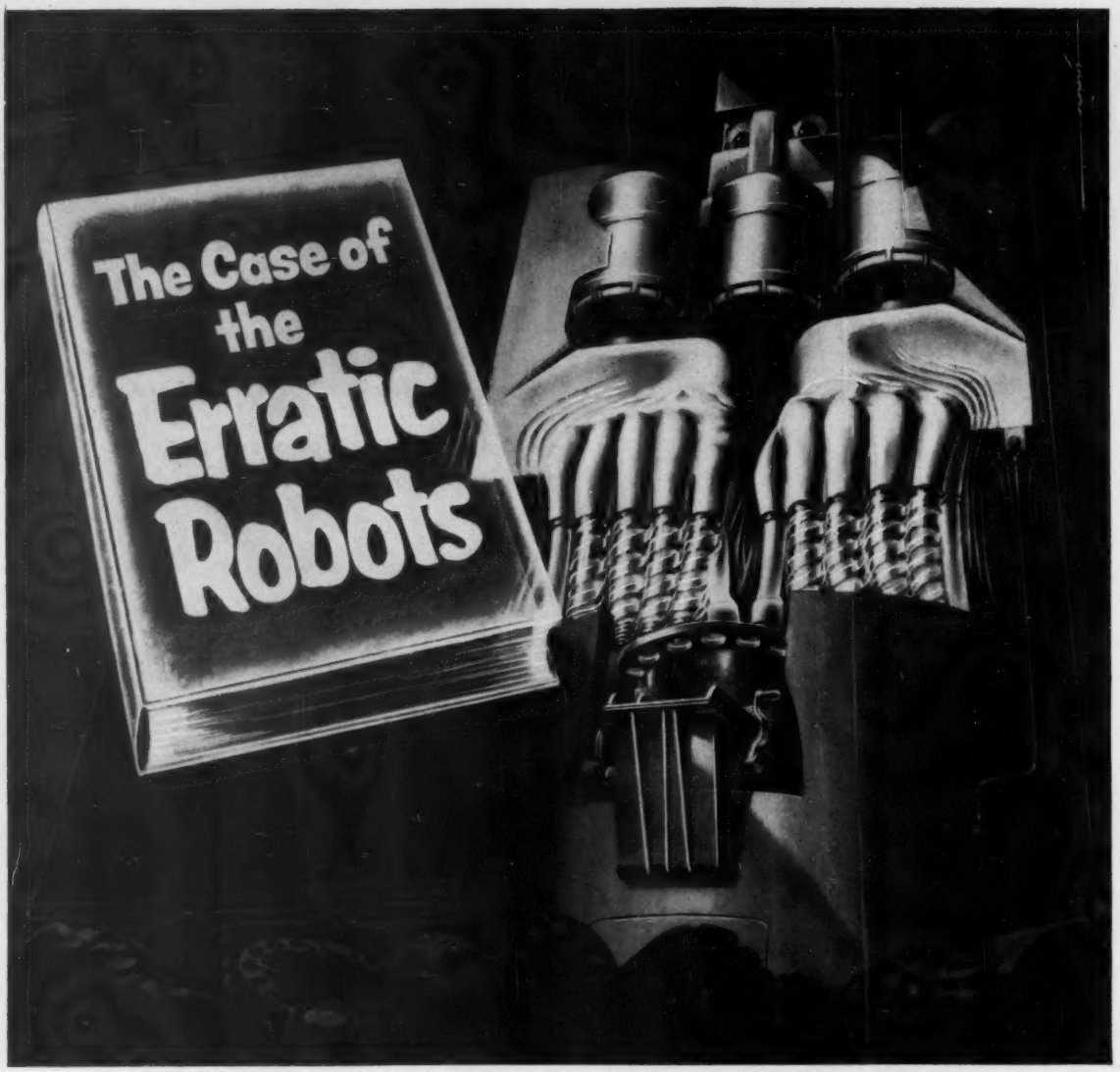
Please send me your illustrated booklet #1703 on the new Monarch Hydra-Slide.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



How Correct Lubrication cured them—saved $7,600

No question about it—these "robots" were *sick!* Temperature of 194°F...."blood pressure" of 800 psi...constant need of transfusions...erratic motion that made them useless for the precision work they were intended to do.

These robots were two hydraulically-operated, automatic machines in a large auto plant. They were used to face and bore flywheel housing assemblies on engine blocks, and were shut down frequently because of hydraulic valve sticking. To overcome this, the operators had doubled oil pressure in the systems. But this, in turn, resulted in excessive oil leakage and high oil temperature that caused fast deterioration of the oil and further valve sticking. Even complete oil changes every two weeks did not eliminate this trouble.

Socony Mobil men tackled this problem. Working with plant personnel, they studied the operations. A carefully designed program of lubrication was put into effect. This cure worked. Oil temperature dropped, and the valve sticking ended. Machine operation was smooth. Parts met precision requirements. Savings have already amounted to $7,600!

★ ★ ★

This combination of the right oil plus the world's greatest lubrication engineering service is called—Correct Lubrication. Why not put it to work in *your* plant to help improve production—cut costs?

SOCONY MOBIL *Correct Lubrication*

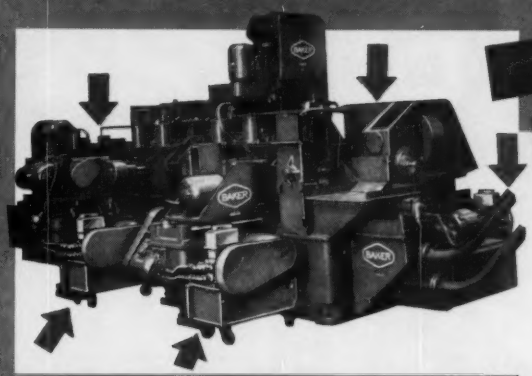
FIRST STEP IN CUTTING COSTS

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.
Formerly Socony-Vacuum Oil Company, Inc.

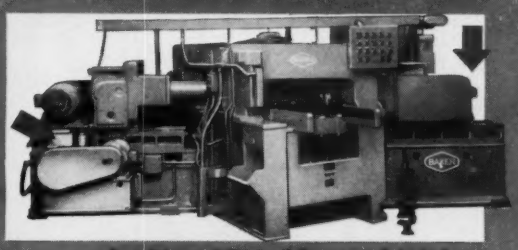
For more information on products advertised, use Inquiry Card, page 243

OILGEAR "JK" FLUID POWER FEED PUMPS

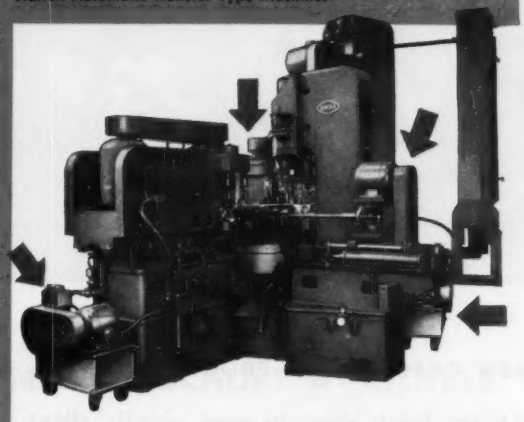
AS APPLIED TO BAKER BROTHERS MACHINES



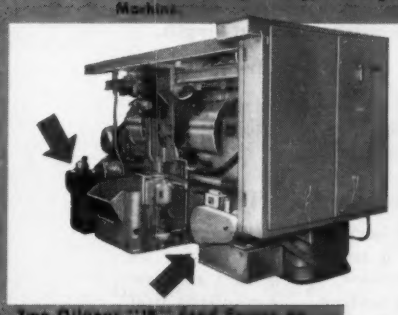
Two Oilgear "JK" Feed Pumps on Baker's Multiple Station Automatic Transfer Type Machine.



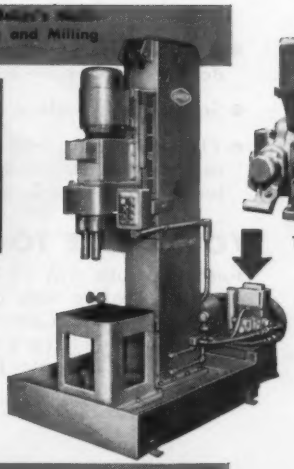
Two Oilgear "JK" Feed Pumps on Baker's Four-Station Automatic Transfer Type Machine.



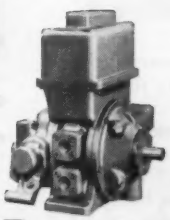
Four Oilgear "JK" Feed Pumps on Baker's Multiple Head Drilling, Boring, Reaming and Milling Machine.



Two Oilgear "JK" Feed Pumps on Baker's Double End Drilling, Boring and Reaming Machine.



Oilgear "JK" Feed Pump on Baker's Double Spindle Vertical Drilling, Boring and Reaming Machine.



Type "JK" Pump Built in four sizes.

HOW CAN YOU USE THESE SIMPLE, VERSATILE, EASILY APPLIED, PROFITABLE UNITS?

Baker Brothers, Inc., pioneers in machine building, users of Oilgear Feed Pumps since 1925, employ Oilgear "JK" Fluid Power Variable Delivery Feed Pumps on a host of machines including the headline-making 100-foot-long transfer machine and their own commercially available portable hydraulic power unit which you can see in photos Nos. 1 and 3 on this page.

The Oilgear "JK" Feed Pump offers many advantages, not the least of which are easy applicability and accessibility. There's no need in many cases for machine redesign and engineering. And this unit does so much to speed cycle time—traverse speed for example can be 265 times feed rate—that production rises dramatically and costs subside. Both coarse and fine feed rates can be varied infinitely so you at once discover the best rates for your work—and the automatic built-in compensator holds the selected fine feed *unvaryingly*. All functions are controlled automatically, semi-automatically or manually.

Evidence of Oilgear "JK" dependability is growing. In one large automotive plant, now 75% changed over to Oilgear, hydraulic maintenance staff was cut from 6 men to one man per shift. In another great automotive plant, the records show Oilgear is found to give the finest service of all.

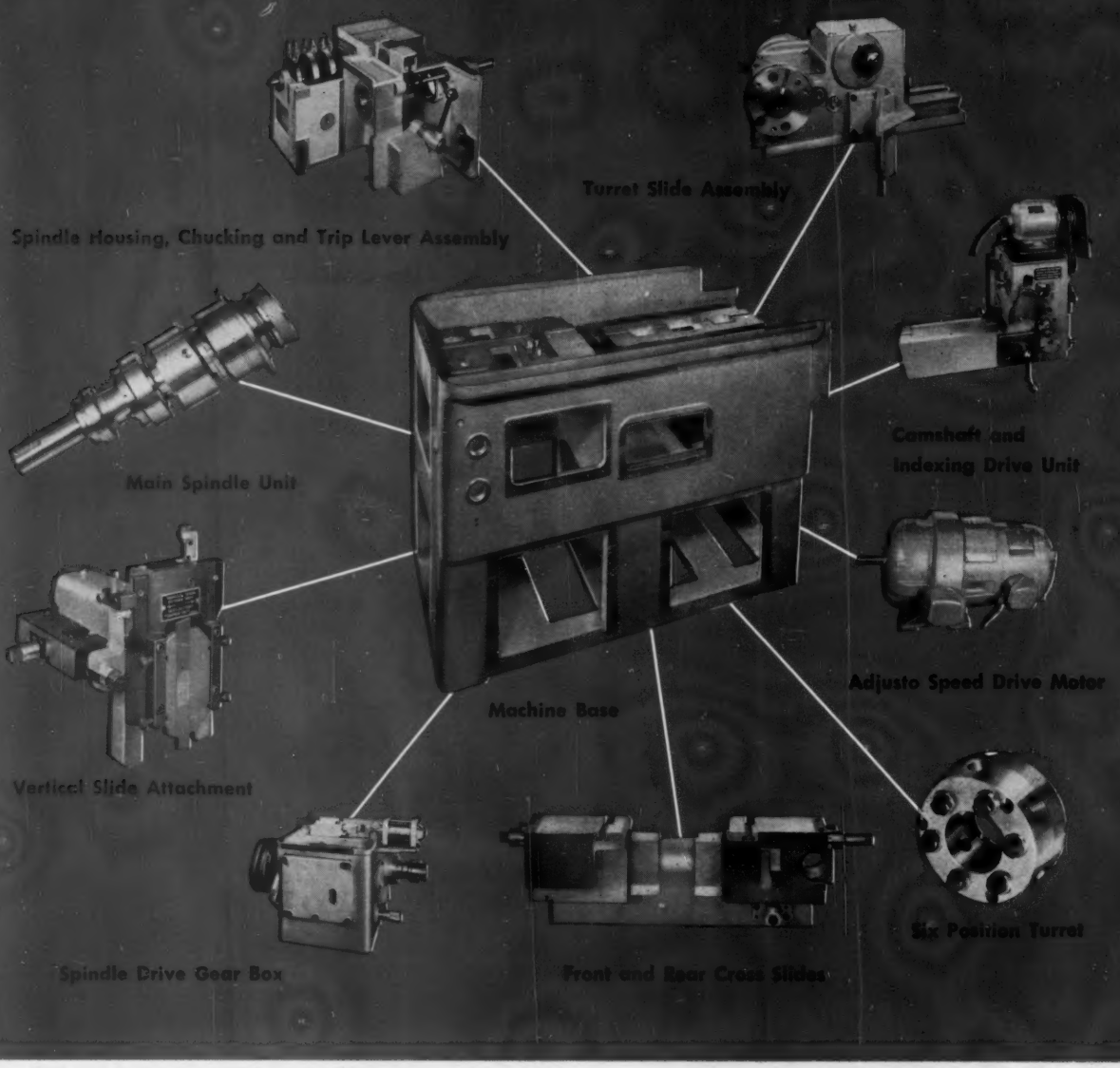
There's much more to tell especially about two new units added to the "JK" line. Why don't you send for free literature that gives all the facts and figures. So you won't forget, send for it now.

THE OILGEAR COMPANY
1569 W. PIERCE STREET
MILWAUKEE 4, WIS.

OILGEAR
Fluid Power

PIONEERS . . . NOW THREE PLANTS FOR FLUID POWER

PUMPS, MOTORS, TRANSMISSIONS, CYLINDERS AND VALVES



DECREASE CAPITAL EXPENDITURES WITH THIS NEW OBSOLESCENCE-PROOF DESIGN . . .

Users of single spindle screw machines have long wanted a machine that would be obsolescence-proof. Here it is—the Detroit Screwmatic 750.

Here is how the Screwmatic's "unit-construction" holds down capital expenditure in future modernization programs. Ten individual units, including the machine base, comprise the Screwmatic 750. When technological improvements or innovations are introduced, they too will be designed in units. The user need only change that unit to have the latest in screw machines—at a nominal cost.

"Unit-construction" is but one of the innovations that Screwmatic brings to the screw machine field. Lower operating costs and high speed production result from these five principles:

- **Infinitely variable spindle speed drive allows exact cutting speed for the job.**
- **Silent V-belt drive to work spindle allows smoother turning and higher speeds.**
- **Stock feeding is through low pressure air cylinders assuring more accurate feed out length.**
- **Standard size collets and feeders are used.**
- **The open front, high wall cabinet gives maximum tool accessibility, effective oil splash protection, and free flow of chips.**

YOU'LL LIKE TO DEAL WITH US

You'll like our way of servicing customers. And you'll be dealing with a company known for its accomplishments in precision, speed, and automation in the field of gear grinding . . . a company that produces the intricate Rzeppa Constant Velocity Universal Joints.

HOW SCREWMATIC'S

"UNIT-CONSTRUCTION"

GIVES YOU AN EVER-MODERN

SINGLE SPINDLE AUTOMATIC

DETROIT Screwmatic 750

NEW BROCHURE AVAILABLE

Includes full description of "unit-construction" principle, specifications, list of standard equipment, photographs and descriptions of outstanding features.

DEALERS NOW DEMONSTRATING. Write for name of dealer nearest you.

A PRODUCT OF

THE GEAR GRINDING MACHINE COMPANY

3921 CHRISTOPHER, DETROIT 11, MICHIGAN

MANUFACTURERS OF: • Fully Automatic Gear Grinding Machines
• RZEPPA (pronounced "Sheppa") Constant Velocity Universal Joints

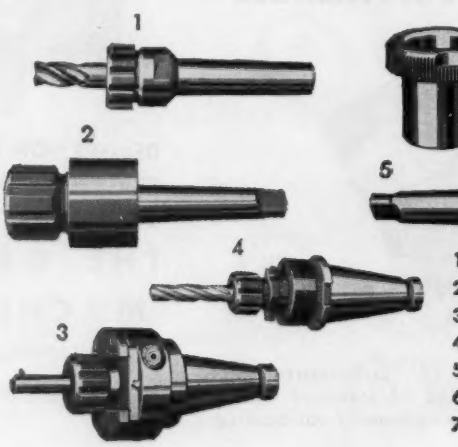
UNIVERSAL
DRILL BUSHINGS OUTLAST THEM ALL!

Several factors contribute to the long life of Universal Drill Bushings. They are machined from an unusually high quality steel. Their superfinish bores reduce wear. The blended radius on the top inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests help guarantee their accuracy and uniform quality. Knurled heads provide a quick, sure grip. Available in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis. — or our home office.

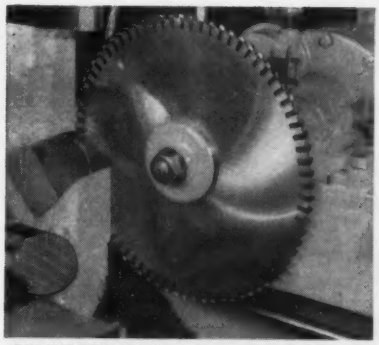
180

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 2, MICHIGAN



1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

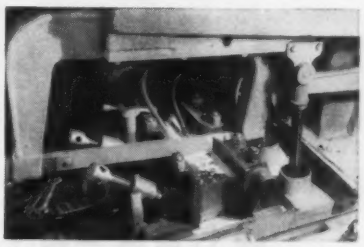


CIRCULAR SAWS. Simonds makes all three types — Inserted Tooth, Segmental, and Solid Tooth Saws. A "right" saw for every metal cutting application.

SPEAKING OF NEW CARS

SIMONDS Helps to Reduce the Cost of cars* like this and yours

Few of us could afford new cars like this without the magic of mass production. One of the things that makes mass production possible is the low cost, dependability of Simonds cutting tools and die steels. Simonds quality has long played an important part in the automotive industry. Carefully maintained by 100% quality control from Simonds own Steel Mill through every step of manufacture in Simonds famous "Windowless" plant, Simonds unique quality keeps production lines moving, unit costs down.



HACK SAW BLADES. Simonds "Red End" Hack Saw Blades (Power and Hand) last uniformly longer, cut metal cutting costs.

BAND SAWS. Simonds makes all three types — Regular Tooth, Sabre or Skip Tooth, Spring Temper — to provide the best blade for every application.

FILES. Mechanics report Simonds "Red Tang" Files feel better, file better, last longer — cut more metal per filing dollar. "Prover-tested" for grade A quality.

SQUARING SHEARS. Simonds single edge shear outlasts other types, costs less for shearing thin sheet metal. Made by Simonds exclusive "Tungsweld" method.

DIE STEEL. Simonds 1001 sizes of flat-ground tool and die steel save more time and money in the toolroom — give excellent results on every job.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

For Fast Service from Complete Stocks
Call your **SIMONDS Industrial Supply DISTRIBUTOR**

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
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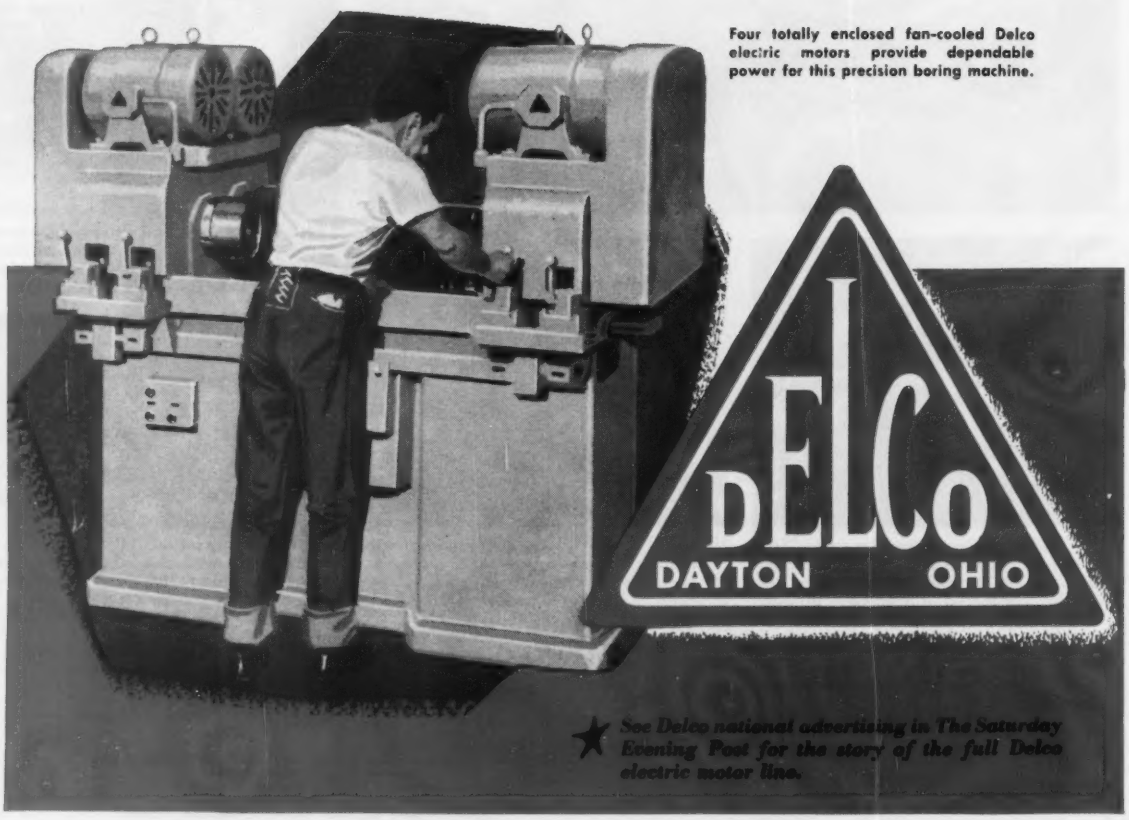
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio
Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

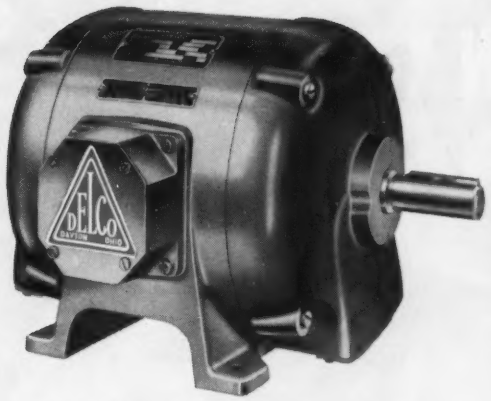
dependable power...

DELCO
Electric Motors



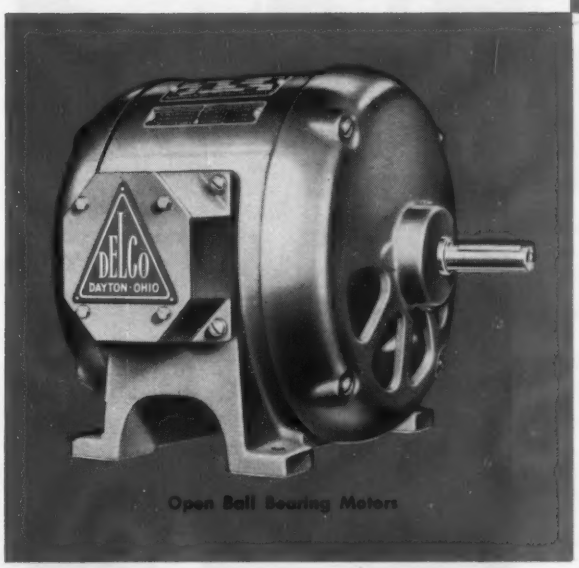
Four totally enclosed fan-cooled Delco electric motors provide dependable power for this precision boring machine.

★ *See Delco national advertising in The Saturday Evening Post for the story of the full Delco electric motor line.*

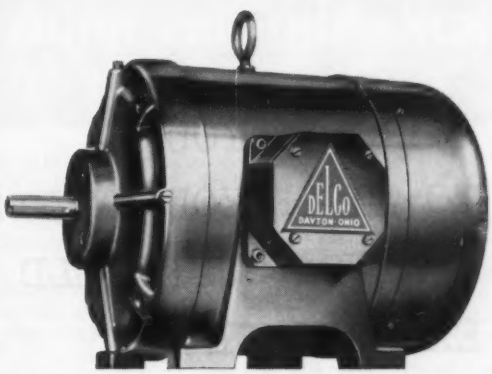


Open Ball Bearing, Drip-Proof Motors

Open Ball Bearing, "D" Flange Mounting



Open Ball Bearing Motors



Totally Enclosed Fan-Cooled Motors

You can always depend on Delco for job-fitted electric motors. Wherever you are, whatever your power needs, just pick up your phone and call us.

Every Delco motor is backed by unsurpassed research facilities and manufactured to rigid standards of workmanship. Then it is carefully tested and inspected before shipment.

But our responsibility doesn't stop there. We'll put Delco engineers right in your plant . . . at your request . . . to work with your engineers on applying the best motor to the job. Delco delivery is always prompt. Delco service is always fast and dependable. For reasons such as these, *wherever electric motors are used, you'll find Delco preferred.*

GM GENERAL MOTORS DELCO

DELCO *Electric* MOTORS

DELCO PRODUCTS, DIVISION OF GENERAL MOTORS, DAYTON, OHIO

Proved best by Performance!

AUTOMATION SHEFFIELD

AND
AUTOINSPECTION
SYSTEMS, CIRCUITS
AND CONTROLS
HAVE BEEN OUR
BUSINESS FOR
MORE THAN A
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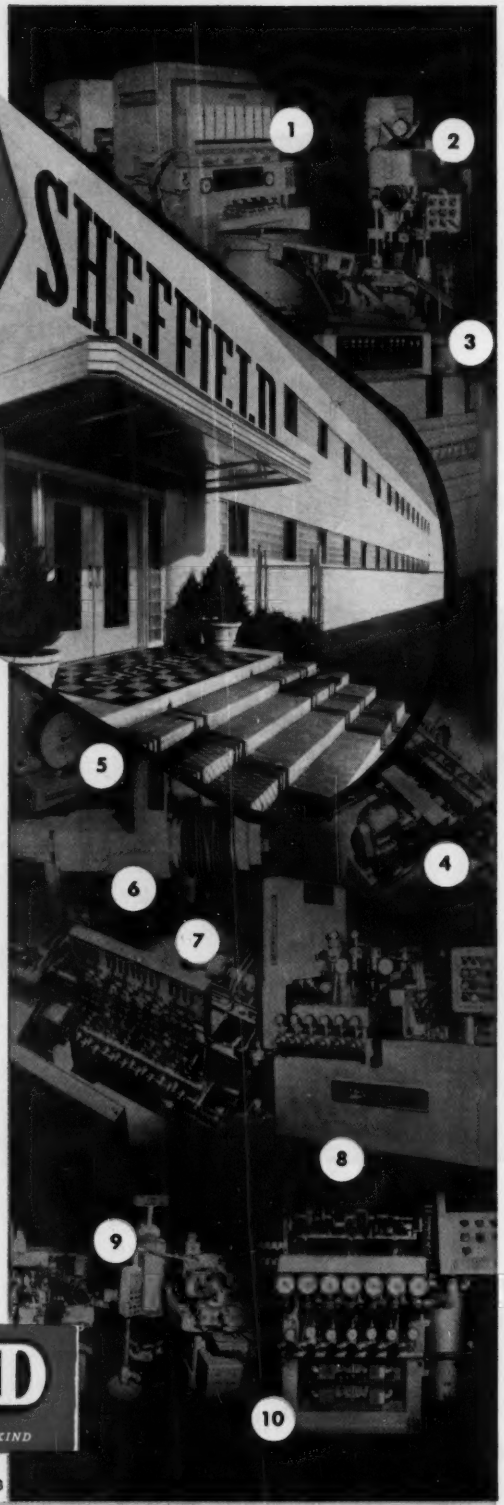
WILL PAY YOU
TO CHECK YOUR NEEDS
AGAINST SHEFFIELD
EXPERIENCE



WRITE DIV. 510 FOR BULLETIN NO. AU-1154

THE SHEFFIELD CORPORATION
DAYTON 1, OHIO, U.S.A.

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

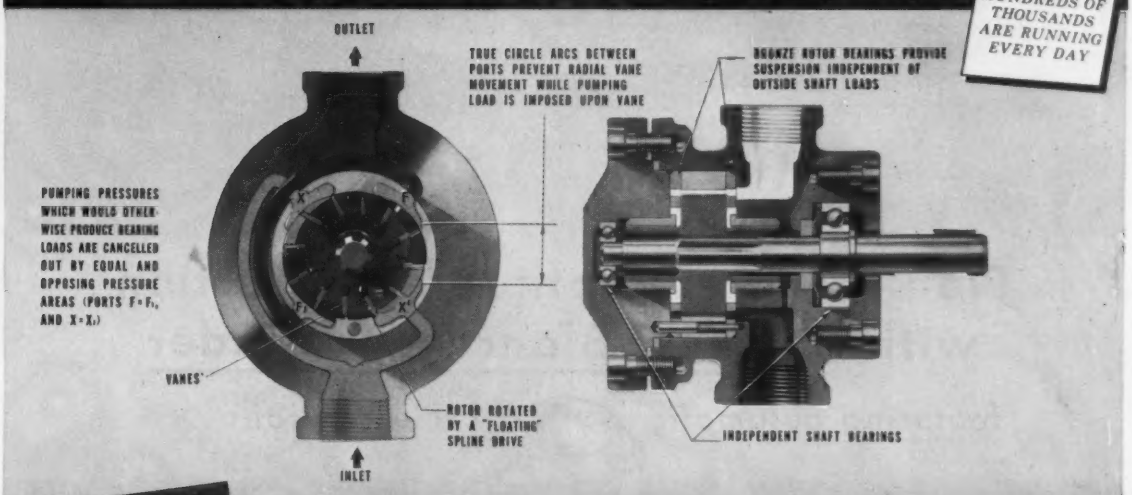
MANUFACTURE AND MEASUREMENT FOR MANKIND

7153

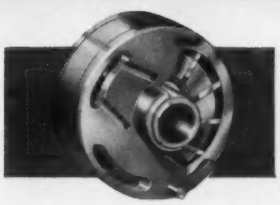
1. Gaging cylinder bores for selective assembly
2. Controlled honing of gear blank bores
3. Automatic gage for 100% inspection of small arms ammunition
4. Connecting rod inspection
5. Controlling the grinding of ball bearing races
6. Post-process size control of bearing races
7. In-line inspection of automobile part
8. Controlling 12 grinding machines
9. Controlling bore size of pinion blanks
10. Automatic gaging of crankshaft main bearings

Question: Why are VICKERS Balanced Vane Type Pumps the most widely used oil hydraulic power pumps?

HUNDREDS OF THOUSANDS ARE RUNNING EVERY DAY


OUTLET
TRUE CIRCLE ARCS BETWEEN PORTS PREVENT RADIAL VANE MOVEMENT WHILE PUMPING LOAD IS IMPOSED UPON VANE
BRONZE ROTOR BEARINGS PROVIDE SUSPENSION INDEPENDENT OF OUTSIDE SHAFT LOADS
PUMPING PRESSURES WHICH WOULD OTHERWISE PRODUCE BEARING LOADS ARE CANCELLED OUT BY EQUAL AND OPPOSING PRESSURE AREAS (PORTS F-F1 AND X-X1)
VANES
ROTOR ROTATED BY A "FLOATING" SPLINE DRIVE
INDEPENDENT SHAFT BEARINGS
INLET

Answer: Because of their SUPERIOR PERFORMANCE and MANY OTHER BENEFITS for the user.



For more than two decades, the Vickers Balanced Vane Type has held the leading position among hydraulic power pumps . . . growing steadily in popularity. The various models (see below) are *the most widely used of all pumps in oil hydraulic service.*

Above is the pumping cartridge which is one of this pump's distinctive features. The many advantages listed at the right merit the thoughtful attention of anyone concerned with the selection and use of oil hydraulic pumps.

VICKERS INCORPORATED

DIVISION OF SPERRY RAND CORPORATION

1403 OAKMAN BLVD. • DETROIT 32, MICH.

Application Engineering Offices • ATLANTA • CHICAGO CINCINNATI • CLEVELAND • DETROIT • HOUSTON LOS ANGELES AREA (El Segundo) • MINNEAPOLIS • NEW YORK AREA (Summit, N. J.) • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE. • ROCHESTER • ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS • TULSA WASHINGTON • WORCESTER

IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto

COMPLETE HYDRAULIC BALANCE—Each inlet and outlet port is balanced by another equal in size and radially opposite . . . pressure-induced bearing loads are thus eliminated. Pressure-balanced porting plates maintain ideal running clearances.

FLOATING SPLINE DRIVE—Rotor is driven by a "floating" spline. Rotor and shaft have separate bearings . . . avoiding strain from drive misalignment.

TRUE-CIRCLE CAM ARCS between ports prevent radial vane movement while pumping load is imposed upon vanes. Wear between vanes and rotor is thus practically eliminated.

ABILITY TO TOLERATE DIRT—Clean oil is of great importance in a hydraulic circuit; but, in spite of care, dirt sometimes gets in. The Vickers Vane Type Pump will pass a reasonable amount of dirt without trouble and without grinding it up.

REPLACEABLE CARTRIDGE—Cartridge (illustrated above left) contains all pumping parts that move . . . none contact the housing. Working parts can be removed and inspected without disconnecting piping or drive coupling. Replacement cartridge kits are available and pumps need not be sent to the factory for repairs. Pump capacity can be changed by simply changing cartridge in the field.

HIGHER EFFICIENCY—Tests prove exceptionally high volumetric and overall efficiency . . . not only when pump is new but also after long service.

AUTOMATIC WEAR COMPENSATION—Vanes are held in contact with the cam ring by centrifugal force and hydraulic pressure. If wear occurs, vanes revolve in a slightly larger orbit without appreciable change in performance.

MINIMUM MAINTENANCE—Hydraulic balance . . . floating spline drive . . . independent bearings . . . automatic wear compensation eliminate the most important causes for maintenance and repair.

TEMPERATURE ADAPTABILITY—Correct running clearances are automatically maintained which compensate for wide variation in oil viscosity resulting from temperature variation.

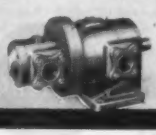
LONGER LIFE—The numerous features mentioned above that keep down maintenance also contribute to longer life. Then, a new cartridge completely rejuvenates the pump.

CONSTRUCTION SIMPLICITY is evident from the illustrations above. This simplicity is another reason for the superiority of Vickers Vane Pumps. For further information, ask for Bulletin 7182

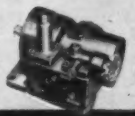
ALL MODELS HAVE THE VICKERS ADVANTAGES MENTIONED ABOVE

Single Stage. Pressures to 1,000 psi. Capacities to 55 gpm.

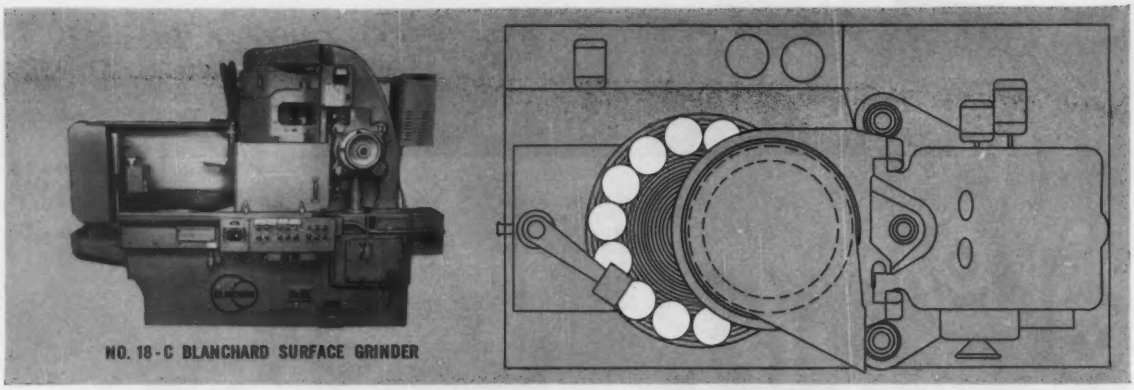
Two Stage. Pressures to 2,000 psi. Capacities to 55 gpm.



Double Pump—Two pumps for separate circuits driven by common shaft.



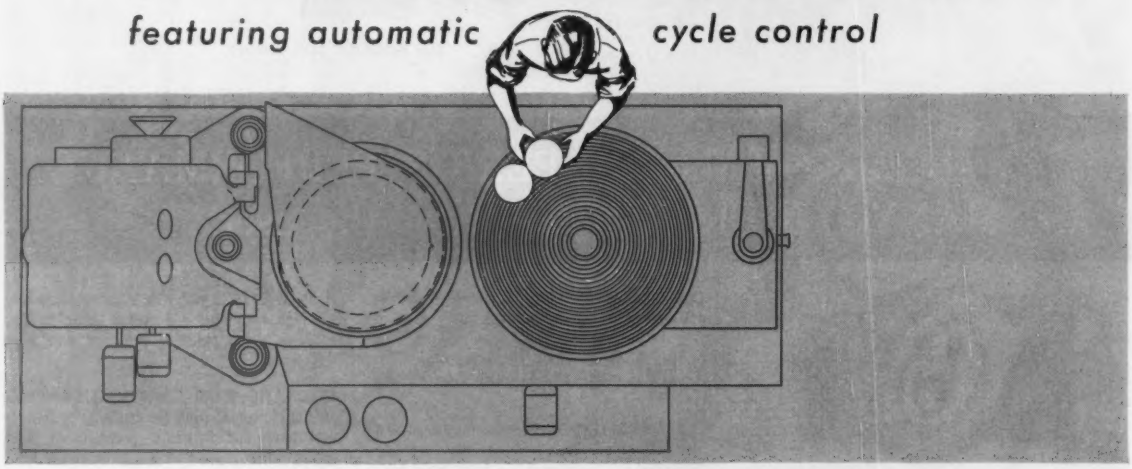
Two-Pressure Pump automatically delivers larger volume at low pressure and smaller volume at high pressure.



NO. 18-C BLANCHARD SURFACE GRINDER

Plan for more profitable production with this new Blanchard Grinder

featuring automatic cycle control



This great new Blanchard has the speed and simplicity which guarantee economical grinding on a wide variety of jobs.

One operator can easily operate two of these automatic cycling surface grinders. By using the automatic cycle, he can unload, clean and reload one grinder while the other grinds automatically.

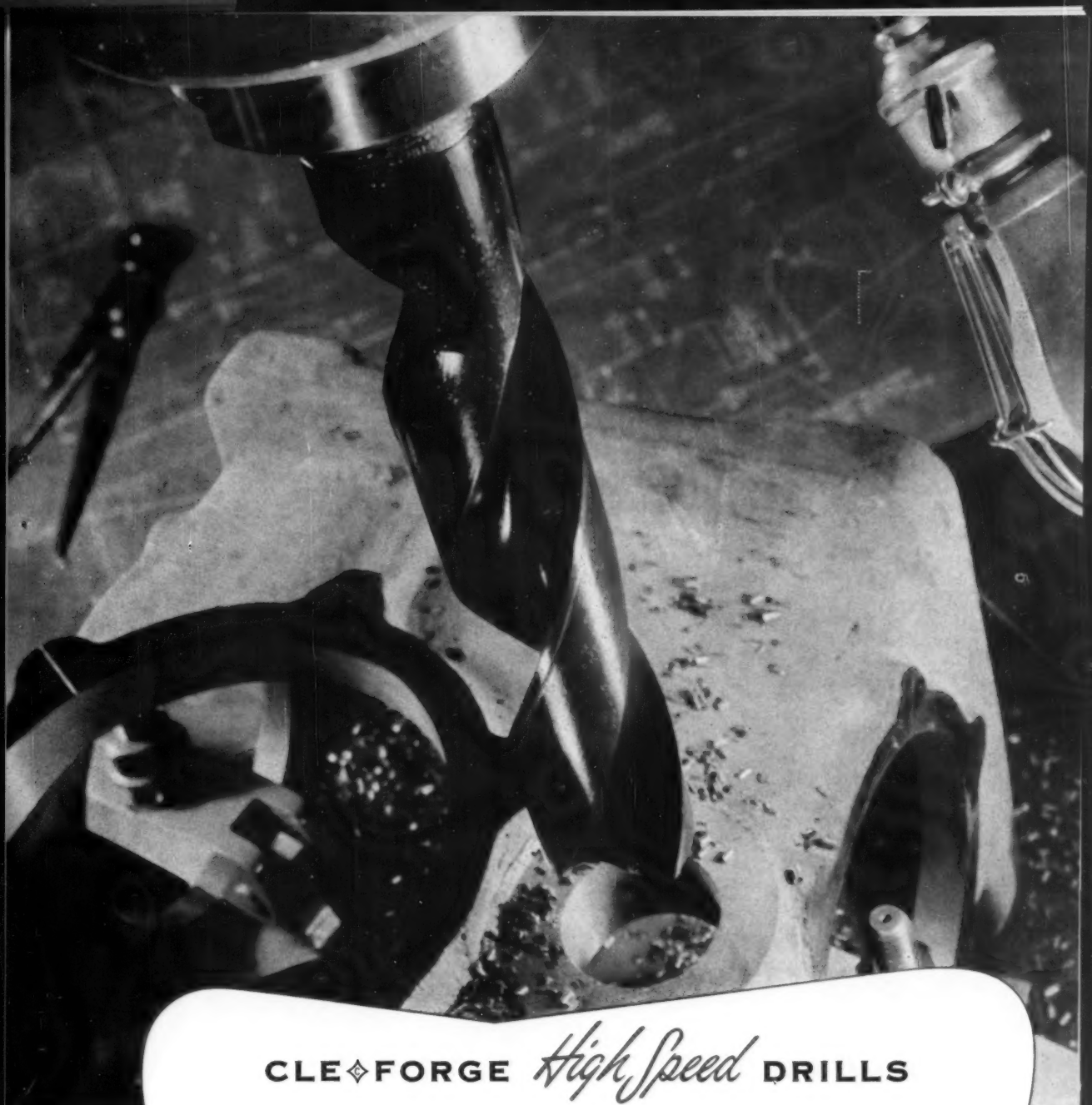
The automatic cycle does everything else: moves chuck (30″ or 36″ dia.) to grinding position and starts it rotating; starts wheel rotation and coolant pump; provides rapid wheel approach to work; engages power down-feed at preset rate; changes to fine feed just before finished size is reached; stops feed when work is to size — "sparks" out; raises wheel head; stops wheel, coolant pump and chuck; moves chuck to loading position—demagnetizes chuck.

The No. 18-C also features: push button selection of manual or automatic operation; automatic size control; simple feed and head traverse controls; adjustable dwell timer.

This new Blanchard offers you many new production advantages. Look into them today—write for free catalog showing work done on the No. 18-C.

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**



CLE-FORGE *High Speed* DRILLS

Give More Holes Per Grind

On every job — no matter how difficult it may be — you'll appreciate the *extra* quality in these famous drills. They produce better work faster, at lower cost. No other drill gives you such outstanding *performance* and *economy.*

THE **CLEVELAND** TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58

E. P. Barrus, Ltd., London W. 3, England

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AUTOMATION GAGING

At The Machine Tool Show
On These Grinding Machines

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★ HEALD
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★ NORTON

All Are Grinding Machines
Where final ACCURACY is Paramount

FEDERAL *DIMENSIONAIR*

and AIR-ELECTRIC Units were used

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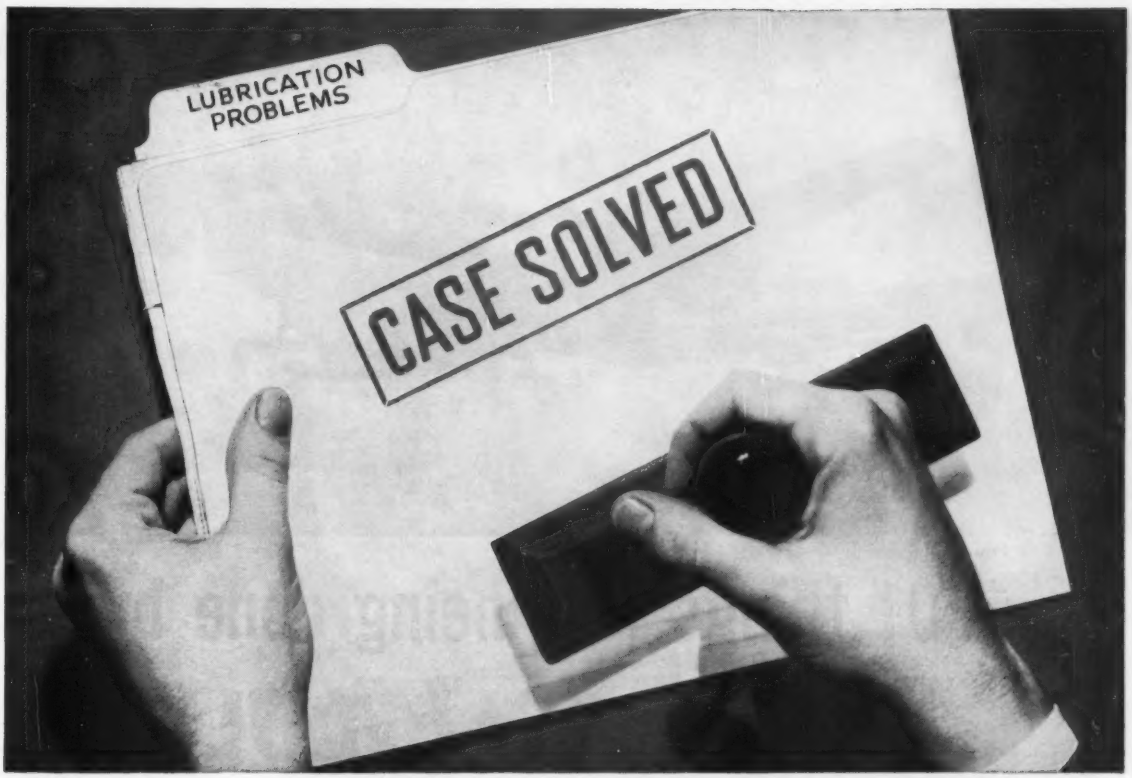
Dial Indicating, Air, Electric, or Electronic —
for Inspecting, Measuring, Sorting, or Automation Gaging

For more information on products advertised, use Inquiry Card, page 243



Vilter Mfg. Co. Solves 3 problems with Cities Service Lubricants

PROBLEM 1. Formation of carbon on air compressor valves, necessitating shut-down to clean every three months.

PROBLEM 2. Mixing of oil and water on valve gears and bearings of engine driving Vilter's 600 KWH generator. Constant draining required.

PROBLEM 3. Groaning of corliss steam valves on Vilter's condensing, cross-compound steam engine.

Since 1867, Vilter Manufacturing Company of Milwaukee has enjoyed the reputation of solving difficult engineering problems in refrigeration and air-conditioning. So it was natural that when Vilter had a lubrication problem, it would solve that also. Natural, too, that Cities Service Lubricants would be those chosen to carry out the task.

Says Vilter's Chief Power Plant Engineer, James Murphy: "The valves on our two-stage, high pressure air compressor were coating with carbon so badly that we had to shut down and clean them every three months. Then we switched to Cities Service DC-300 Oil. Now, after nine months, valves are perfectly clean and our carbon problem is gone.

"At the same time we tried Cities Service Pacemaker No. 3 to stop a problem of oil mixing with water on the valve gears and bearings of the steam engine driving our 600 Kilowatt hour generator. The problem ceased and for more than nine months we haven't had to change the oil because it does not emulsify with water.

"We also silenced groaning from the corliss steam valves of this steam engine by switching to Cities Service Optimus No. 3."

If you have a lubrication problem talk to a Cities Service Lubrication Engineer. Chances are he can solve it. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

1001 things now being done by

COLD-ROLL FORMING

As your production requirements grow, new opportunities for effecting economies are offered by cold roll forming components. A few applications are illustrated here: The structural parts of the new Giant 74-ton Boeing Stratofreighter KC-97G are, as in most other planes, made almost entirely from cold-roll-formed shapes because of their high strength-weight ratio.

In the modern warehouse shown at left, the steel decking and rolling steel doors were cold roll formed and installed by the R. C. Mahon Company, Detroit, Michigan.

In the photo of an Armstrong furnace below, the arrows point to the jacket rings and two pilasters framing the front openings—all cold roll formed at a big saving compared with previous methods.

The new Yoder book on Cold Roll Forming is an illustrated story of many of the things which are made lighter, stronger and more accurately by this process than by any other, yet at greatly reduced cost. It is also a complete textbook on the machines, their tooling, operation, and economic possibilities.

A copy is yours for the asking.

THE YODER COMPANY
5504 Walworth Avenue • Cleveland 2, Ohio

Complete Production Lines

- ★ COLD-ROLL-FORMING and auxiliary machinery
- ★ GANG SLITTING LINES for Coils and Sheets
- ★ PIPE and TUBE MILLS—cold forming and welding

ENGINEERING YODER MANUFACTURING

New 6" x 18" hand feed

Thompson Grinder

FOR SHOPWORK
OR TOOL ROOM

Completely anti-friction and permanently lubricated machine. Available with all types of attachments found on tool room surface grinders including interchangeable horizontal and vertical wheel heads. A Thompson high quality precision machine at this low price.

ONLY
$2,500*

PRECISION PETE says:

FOR LOW COST AND QUALITY YOU JUST CAN'T BEAT THOMPSON
Make your next hand feed grinder a Type D Thompson . . . write today for the new descriptive catalog, D-55

* Price F.O.B. Springfield, Ohio U.S.A., Subject to Change Without Notice.

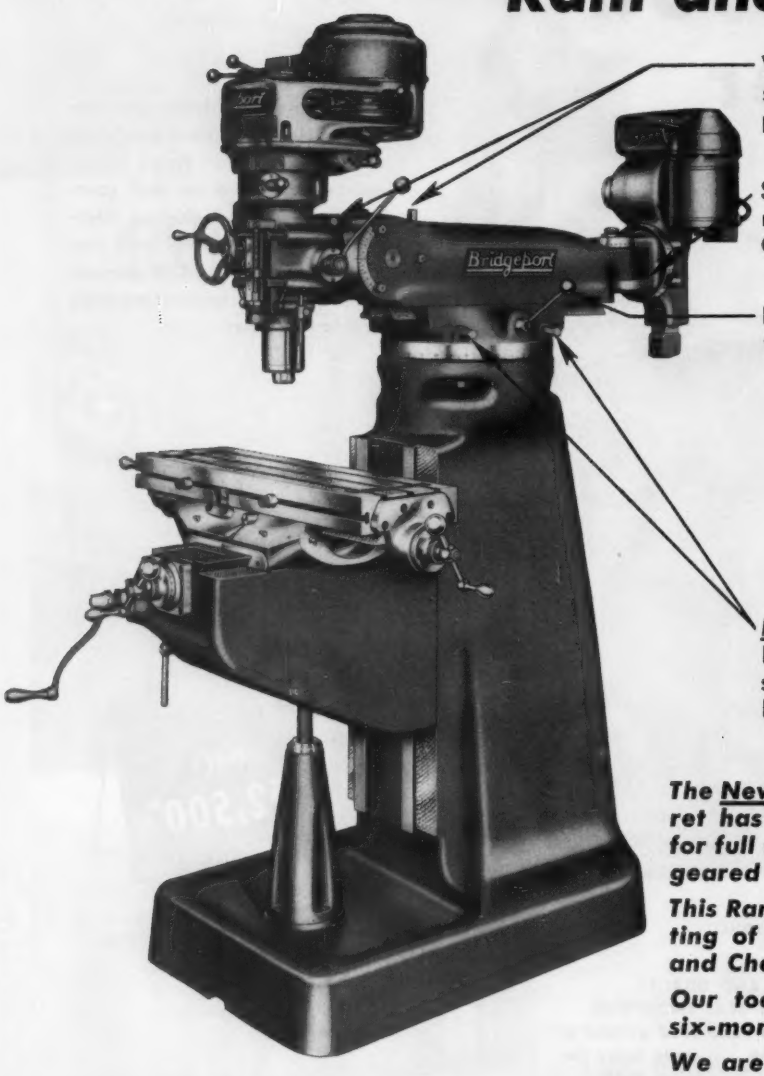
Call, write or wire today

Thompson Grinders

The Thompson Grinder Company at Springfield, Ohio

PRESENTING—

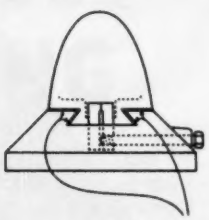
the NEW *Bridgeport* Ram and Turret



WORM GEAR ADJUSTMENTS for setting head at angles in two planes or combination of same.

STANDARD SWIVEL ADAPTER makes it possible to set Shaping or Cherrying Attachments at angles.

RACK AND PINION CONTROL for in or out movement of Ram.



NEW (pat. pending) EXPANDING DOVETAIL LOCK binds all four surfaces together giving vibration-less performance.

The New BRIDGEPORT Ram and Turret has been designed and tested for full utilization of the 1 HP back-geared BRIDGEPORT Milling Head.

This Ram permits full universal setting of the Milling Head, Shaping and Cherrying Attachments.

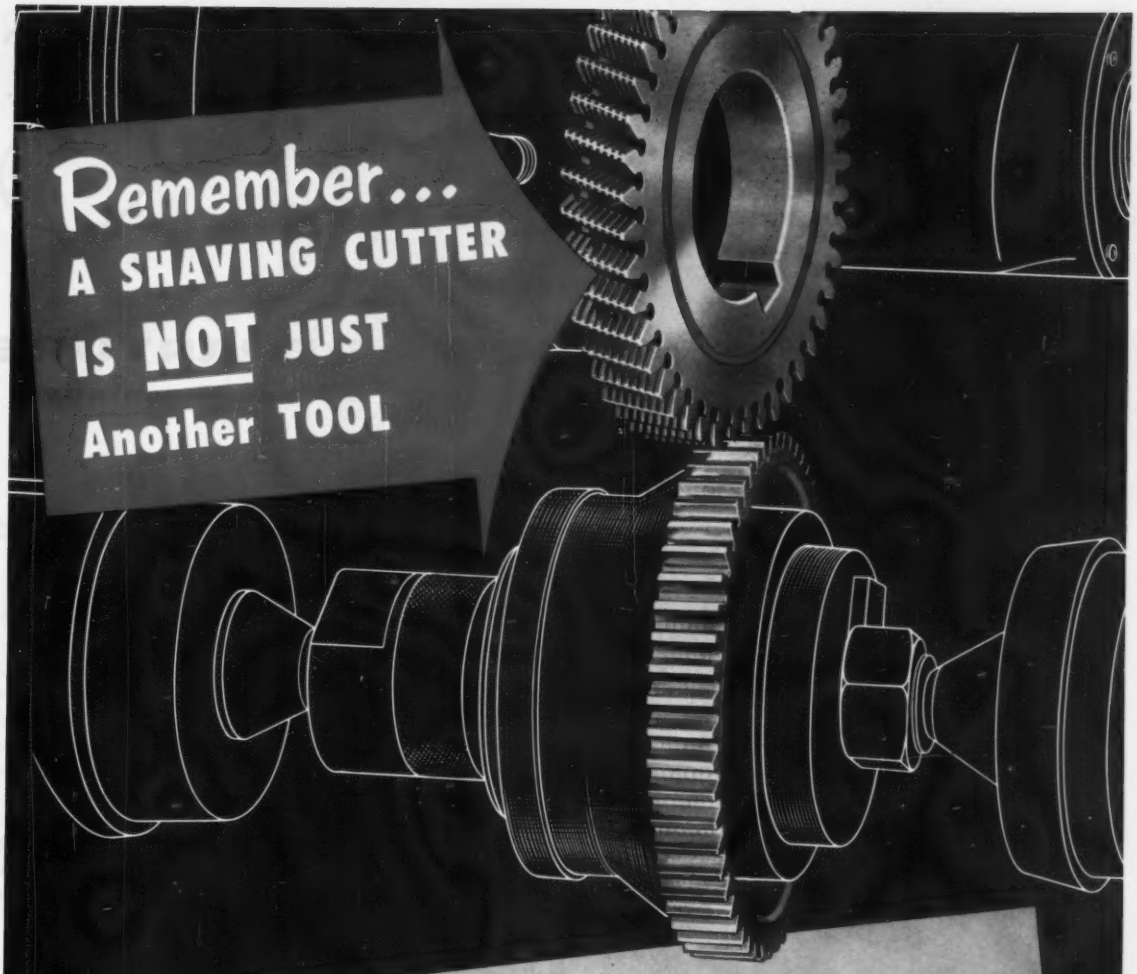
Our toolmakers prefer it after a six-month test.

We are sure you will like it.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines



Remember... A SHAVING CUTTER IS NOT JUST Another TOOL

EXPERIENCE

Making the successful rotary gear shaving cutter requires not only the consummate skill of the master toolmaker, but also a thorough knowledge of gear practice. The latter is acquired only the hard way, by experience — a lot of it.

No group anywhere has had as much cutter experience as Red Ring engineers who developed Rotary Gear Shaving. They have been learning more and more about cutters for the last 25 years — and still are.

DEVELOPMENT

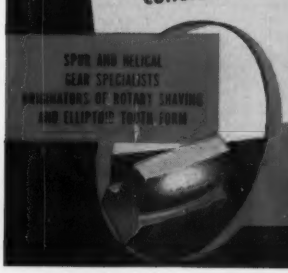
It would be convenient indeed if all cutters could be made to a standard design, interpolating only for variations in basic gear characteristics.

Unfortunately, there are many variables which often make modifications essential. But, how much modification? Where to apply it? The answer again is EXPERIENCE with the performance data to substantiate it.

Service of this type provided by Red Ring engineers can make a valuable contribution to your gear processing operations.

Next time you buy shaving cutters be sure you are getting the maximum.

7162



NATIONAL BROACH & MACHINE CO.

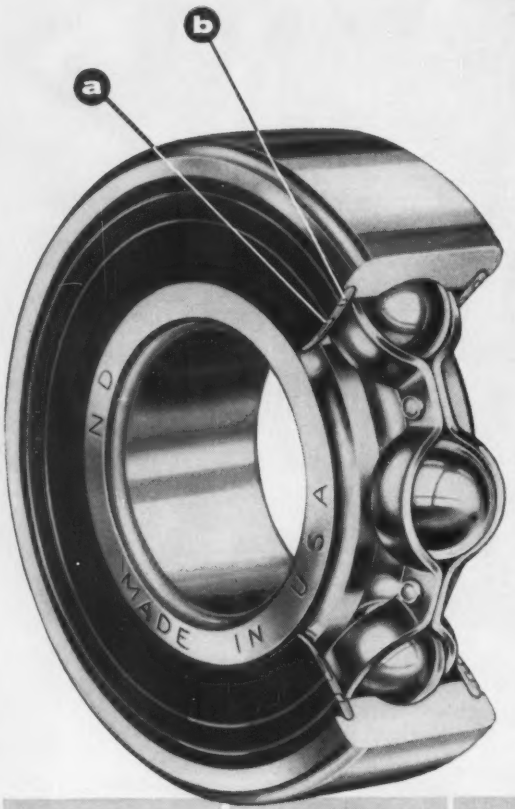
5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

FACTS

about

NEW DEPARTURE
BALL BEARINGS



New Sentri-Seal...on guard against dirt and wear!

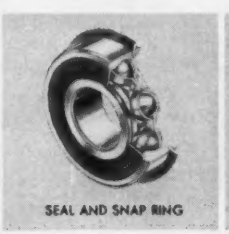
The unique design of the Sentri-Seal gives optimum protection against dirt, and includes a number of other major advantages.

Sentri-Seals are quickly removed, easily replaced. As the seal is of synthetic rubber, in which two metal rings are embedded, a constant-rate spring is created between the rings. Inherent flexibility prevents distortion of the bearing outer ring due to seal insertion, permitting the use of bearings to the higher accuracy specifications. The spring action maintains an efficient sealing contact with the bearing ring to bar dirt and retain lubricant. Sentri-Seals are relatively inert to oils and greases and operate satisfactorily through a temperature range of −40°F to 225°F. Specifications available for still higher temperatures. In applications where relubrication is desired, it is easily accomplished by the injection method.

The New Departure Sentri-Seal basically consists of two separate metal rings, "A" and "B", embedded in synthetic rubber, resulting in a spring which absorbs distortion and deflection. The seal is not drastically influenced by axial displacement due to bearing end-play within prescribed tolerances, and provides efficient sealing at low torque. Bearing shown is equipped with two seals.

ONE SENTRI-SEAL

SEAL AND SHIELD

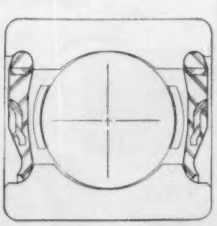

SEAL AND SNAP RING

TWO SEALS AND SNAP RING

SEAL, SHIELD AND SNAP RING

The diagram shows in section the New Departure Sentri-Seal. Lip contacting surfaces are form-ground simultaneously with the ball race, giving an extremely high degree of concentricity between sealing surfaces and the raceway.

Sentri-Seal is available for a range of sizes in single-row, standard-width bearings and also in two types of New Departure adapter bearings. Sizes, dimensions and capacities are listed in the latest New Departure catalog.



Write for full details on Sentri-Seal

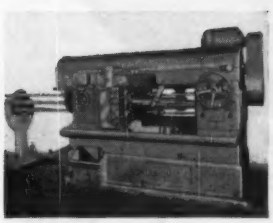
NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

First with NEW "Automatic" Service

Cone was the first builder of multiple spindle automatics to provide machine users with an experimental service in the application of carbide tools.

This service is a practical means of determining the possibilities of carbide tools for production men without loss or interference with their regular production schedules.

A pamphlet "FOUR STEPS WITH CONE" describes this service. Send for your free copy.



Conomatic

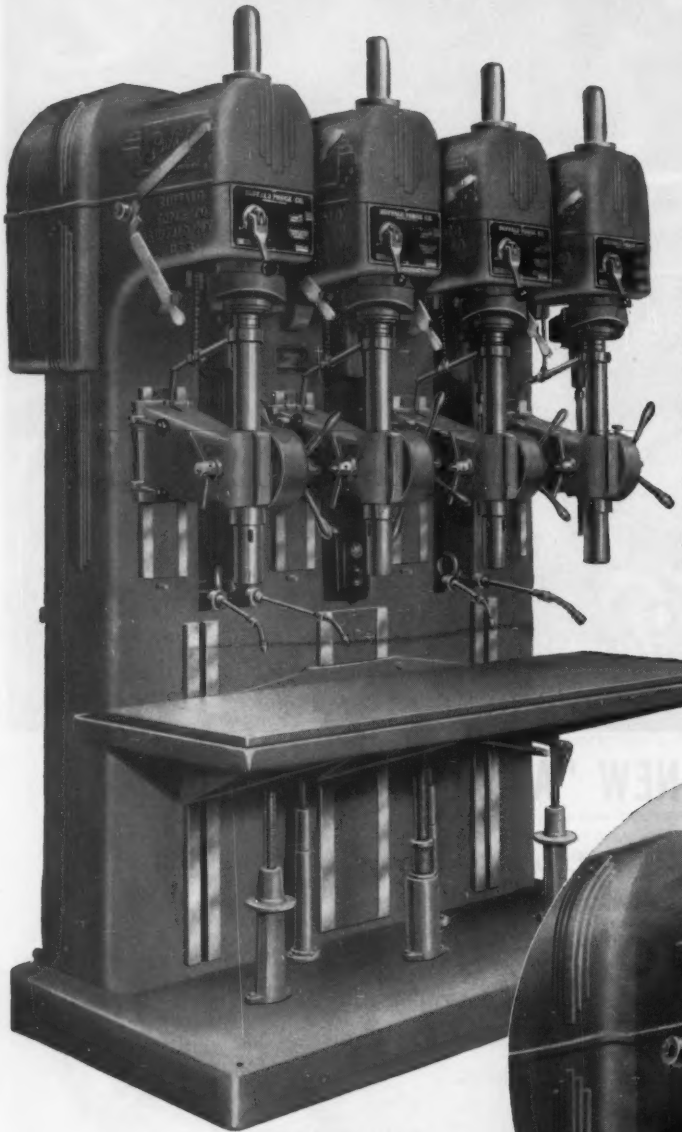
THE MACHINE TOOL SHOW CHICAGO, ILL.

BOOTH 401

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

ON THESE PAGES — THE ANSWER

NAME CAPACITY—STYLE—NUMBER OF SPINDLES



"BUFFALO" RPMster — ANSWER TO THE PRODUCTION MAN'S DREAM

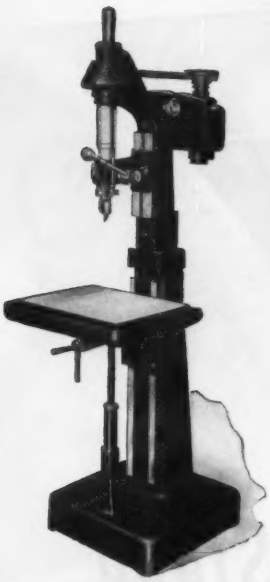
For the shop that demands the finest, this popular machine offers "everything"—INSTANT SPINDLE SPEED SELECTION without shutting off the motor—back gearing—all-geared power feed — the famous "Buffalo" precision ball bearing spindle—easy action table raising screws with hand scraped ways. Check these and other practical features in BULLETIN 3257A, your copy on request. Here's a machine typical of the "Q" Factor* value you get when you specify "Buffalo".

BELOW: handle on left gives instant speed selection — handle on right shifts into back gear, on the RPMster.

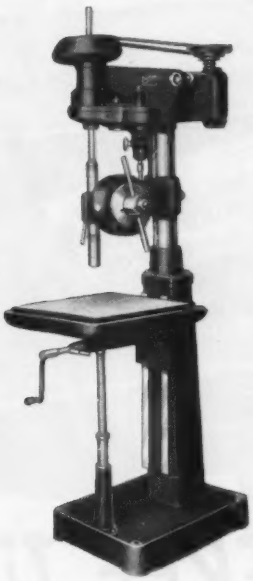
**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

TO YOUR DRILLING PROBLEM

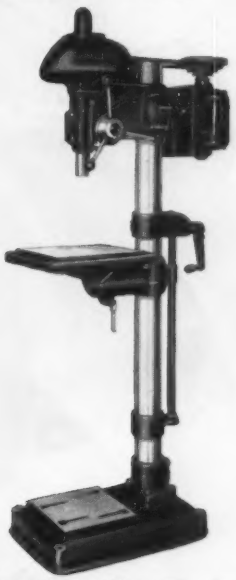
—SPECIAL FEATURES—"BUFFALO" BUILDS IT!



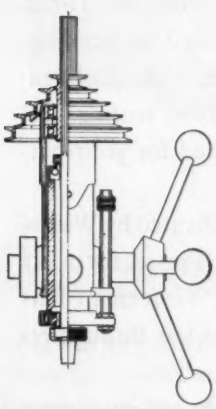
FOR DRILLING PRECISION PARTS the "Buffalo" high-speed No. 14 Drill handles from 3/8" down to the smallest commercial size drills. Bench or pedestal models, one to six spindles. WRITE FOR BULLETIN 2730G.



SENSITIVE OR POWER FEED; 8", 12" or 15" overhangs; models up to 6 spindles with coolant system—the 7/8" capacity No. 16 "Buffalo" Drill is a best buy in its size. WRITE FOR BULLETIN 2730G.



PRODUCTION FAVORITE! The husky 1" capacity No. 18 Drill offers 19 models. Choice of number of spindles, floor, pedestal and bench models to meet the most particular requirements. WRITE FOR BULLETIN 3123.



LASTING ACCURACY, EASY OPERATION! The "Buffalo" spindle is turned, ground and polished of high grade steel; turns smoothly and without end-play on precision ball bearings. Its six splines are fitted so accurately to the broached pulley that up-and-down motion is almost effortless.

ALL-AROUND RUGGED ½" DRILL — the "Buffalo" No. 15 is available in a very wide choice of arrangements, attachments. Single or multiple heads. A true production tool. WRITE FOR BULLETIN 2963G.

EASY HANDLING BIG-JOB DRILL — the 2" capacity No. 22 Drill stands 96" high, yet handles as easily as smaller, sensitive drills. Available with power feed. One to four spindles, round column or pedestal. BULLETIN 2989G.

ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

BUFFALO FORGE COMPANY

140 BROADWAY BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING ● **PUNCHING** ● **SHEARING** ● **BENDING**

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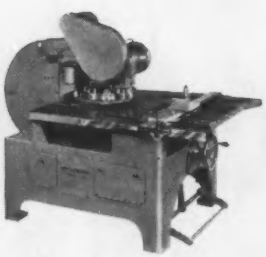
Send Drawings of Your Work to WIEDEMANN

for a FREE Time Study



From the small hand operated R-2 to the 150 ton Turret Punch Press, there's a Wiedemann designed for your short run piercing needs.

Learn how you can save 60% to 90% on piercing steel sheet or plate in small to semi-production lots with a Wiedemann Turret Punch Press . . . and these cost saving facts are based on drawings of your typical jobs. In addition, you will receive, without obligation, a recommendation for the most efficient, low cost tooling, and a detailed quotation on the Wiedemann best suited for your particular requirements.

This is not a new service. The cost reductions indicated by Wiedemann surveys have been selling these Turret Punch Presses for many years. It will pay you to get the facts about how a Wiedemann Turret Punch Press can pay for itself in two years or less through reduced piercing costs.

Send drawings of your work for a free time study and equipment recommendation or write for Bulletin 101 today.

WIEDEMANN MACHINE COMPANY

4206 Wissahickon Ave. P.O. Box 6794 Philadelphia 32, Pa.

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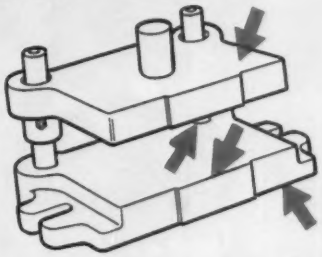
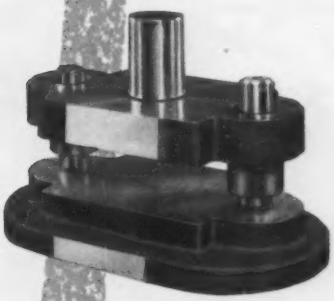
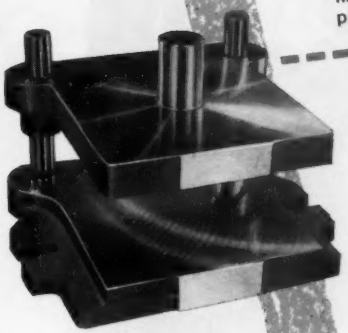
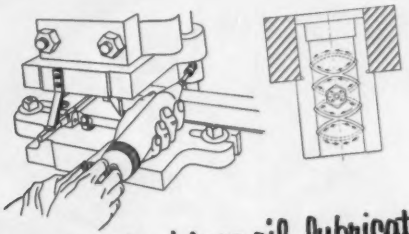




all horizontal surfaces ground

Now, in addition to the vital die surfaces of all steel or semi-steel sets, all horizontal surfaces, including tops of punch holders, are ground with the same precision that has made Danly quality the accepted standard. Surface grinding assures a flat, true working surface, saves tooling time and improves accuracy.





Shoulder bushings oil lubricated

All Danly Standard Sets equipped with shoulder bushings are designed for easy, pressurized oil lubrication. Fittings in bushing shoulder are easily reached from front or side. Cut-away sketch shows oil channels in bushing that form lubrication reservoir for long runs and maintain oil film with a minimum of clogging or gumming.

New features like these keep DANLY ahead

Throughout the years, the rigid precision standards of Danly have made Danly Die Sets the recognized standard for quality. Now Danly Die Sets offer you two new features to save hours in the die shop, make tooling-up much faster and assure longer die life. All new Danly Die Sets have an oil lubrication system for shoulder bushings and all horizontal surfaces are ground to assure a true working surface for die making. Danly's nationwide system of assembly branches is ready to serve you. Call Danly today.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

HERE ARE THE DANLY PLANTS THAT SERVE YOU

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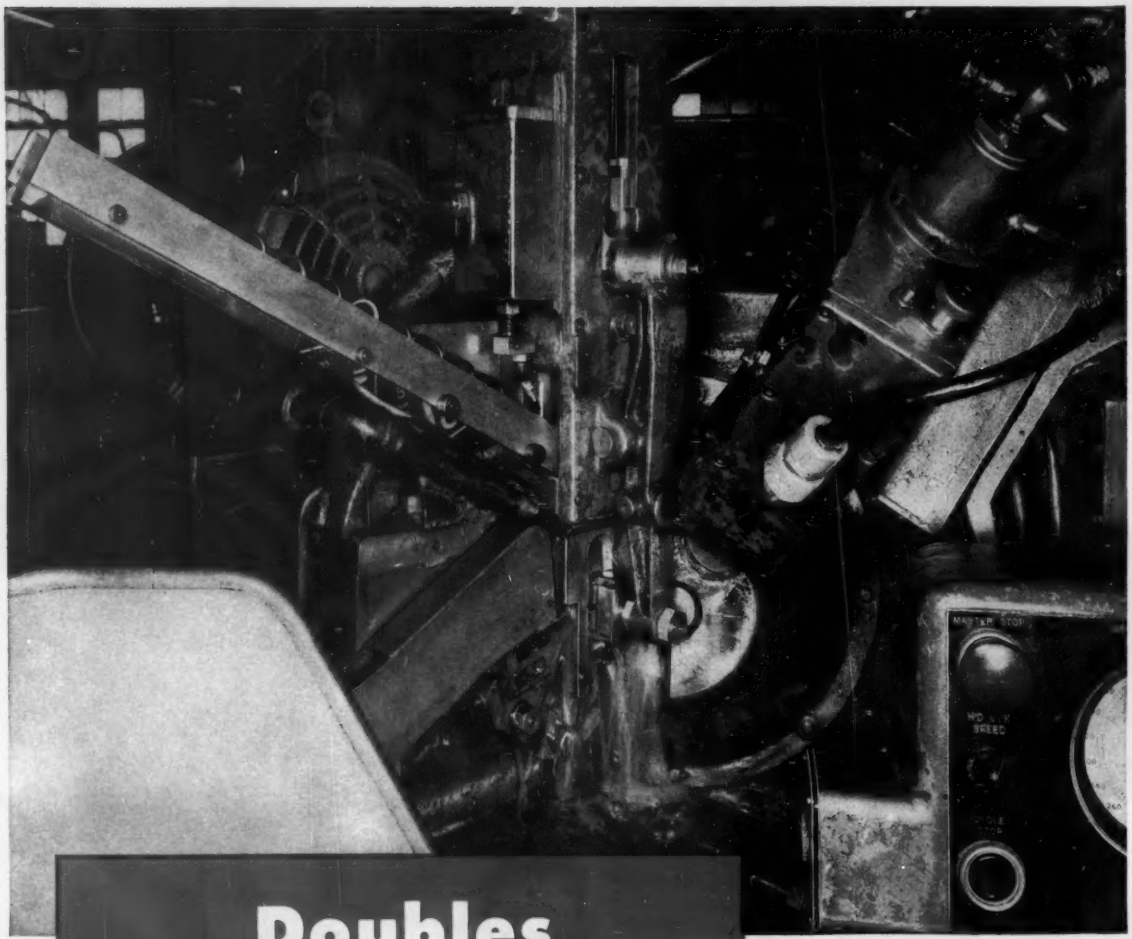
DANLY



Doubles production per wheel dressing

IN GRINDING bearing cones, this manufacturer (name on request) formerly used two different competitive oils—one to lubricate the machine, the other as grinding oil. Contamination of the machine oil by the grinding oil caused bearings to fail after only about three weeks.

A Texaco Lubrication Engineer was called in. He recommended using a dual-purpose oil to serve as both machine lubricant and grinding oil. Machines were changed over to *Texaco Cleartex Oil* and the manufacturer reports no bearing failures for over a year. In addition, he can get as many as twenty pieces (with better finish) per wheel dressing, as against the ten or twelve previously obtained.

There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do all your machining better, faster and at lower cost. A Texaco Lubrication Engineer will gladly help you select the proper ones.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

TUNE IN . . . TEXACO STAR THEATER starring JIMMY DURANTE on television . . . Saturday nights, NBC.

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By LORING F. OVERMAN

Plan for Second Session of Eighty-Fourth Congress

What does Congress do between sessions? Did the wheels of government stop when members of Congress adjourned on August 3, leaving behind 390 completed pieces of legislation?

On the contrary, the Capitol Hill legislative plant is merely re-tooling. Having completed the first session of the Eighty-Fourth Congress with a good record, particularly in foreign affairs, Senators and Representatives are now tooling up for Operation Domestic—the project that is supposed to line up the votes at the 1956 elections.

Middle-Roaders

The Congressional session just completed was a middle-of-the-road affair. Both houses were too evenly divided to permit overriding a veto, or swamping opposition by sheer weight of numbers. The Senate count stood at 49 to 47 in favor of the Democrats, with the House at 232 to 203—Republicans again taking the short end.

As a result, the legislation passed was generally non-controversial. Some of the proposals in the controversial category cleared the House or the Senate, but they are being held over to await opening of the second session of the Eighty-Fourth Congress, January 3. It is these hold-over measures, with some new ones sure to be introduced, that Congressional committees and individual members will be concerned with during the weeks between now and January 3.

The current Congressional recess gives both legislators and constituents an opportunity to get their ducks in a row for the showdowns that must come when uncompleted legislation comes up for final action in January.

On 1956 Agenda

Following are some of the subjects left over for the coming session to settle:

Defense—Congress extended the Defense Production Act for only one year from July 31, 1955, so the subject must come up again next session if programs like these are to be continued:

1. Priorities and allocations on materials for military and atomic energy contracts.
2. Stockpiling of long-lead-time machinery items.
3. Loans and other inducements to encourage expansion of defense plants.

Taxes—It is expected that some "vote-getting" individual tax concessions will be proposed, and that there will be a new packaged bill proposing a number of technical changes in taxes affecting business.

Renegotiation—Machinery people having sizable government contracts will be affected by next session's decisions regarding renegotiation. The present law will expire at the end of 1956. The Congressional Joint Committee on Internal Revenue Taxation has been asked to study the subject to help Congress decide whether to extend the act.

Social Security—Hearings will be held by the Senate Finance Committee on the House-passed bill H.R. 7225. This legislation would liberalize social security benefits and increase the wage tax for both employer and employes. This is one of the vote-getting projects which is expected to attract much attention

Highways—Washington observers were somewhat surprised when the House and Senate failed to agree on legislation proposed to expand the Nation's highways. Members of both Houses agree as to the need for such a program. The coming session will try to remove the stumbling block—how to finance the work. The present law, providing a means of sharing costs with the individual states, will expire in 1957. Since Congress always works a year ahead on highway appropriation measures, action of some kind next year is a must.

Wage-Hour—This year's changes in wage-hour legislation increased the minimum wage to $1 per hour for covered workers in interstate commerce. Next year's proposals will involve extending coverage to other workers. Although machinery people are probably not directly affected by the minimum wage provisions of the Fair Labor Standards Act, existence of such a base for regular pay and overtime can be expected to be reflected in demands for related pay increases for workers already earning more than the minimum.

Hoover Recommendations—Machinery people who believe that cutting government expenses is the first step to tax reductions should support the Hoover Commission's recommendations. Just before Congress adjourned, the second Hoover Commission completed its work and submitted 20 reports covering 17 functions of the Executive Branch of the Government. The reports contained 314 recommendations which would require Congressional authority for action. Some 150 bills have been introduced to implement phases of these recommendations.

Hearings, Investigations

Besides the unspectacular study of proposed legislation, including taking soundings from constituents, some members of Congress will be engaged in publicity-producing hearings and investigations. Since all Congressional Committees are controlled by Democrats, it is quite likely that some of the topics selected for airing may spark pre-election controversy.

Among the investigations planned are:

Anti-Trust—Investigations of varied retail activities, exclusive dealerships, and foreign trade were planned by the Senate Judiciary Committee.

Business in Government—House Judiciary Subcommittee plans to resume in October its investigation of WOC's—businessmen who serve the government without compensation. Such WOC's have been most helpful in correlating activities of the machinery industry with the defense effort.

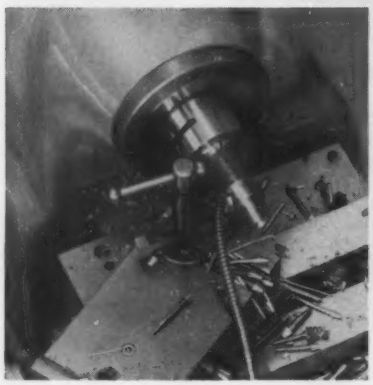
Small Business—Continued inquiries into business defense activities, particularly those of the aluminum industry, are planned by the House Small Business Committee. The Small Business Administration was continued for two years by the Eighty-Fourth Congress, first session, and provision has been made for the agency to take a more active part in defense program affairs.

Stock Market—Another opportunity for lively publicity lies in the Senate Banking Committee's plan to resume investigation of the stock market. Announced purpose is to pin point issues that came up in an earlier study.

Taxes—The House Ways and Means Committee has named subcommittees to study taxation of life insurance companies, administration of excise taxes, and several technical tax administration problems.

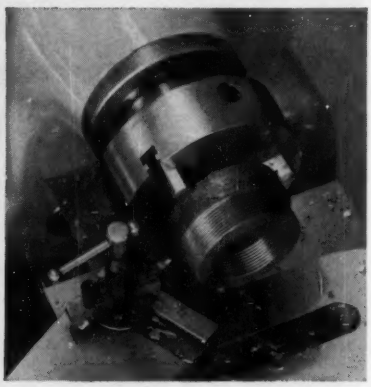
HARDINGE
ELMIRA, N.Y.

"The Outstanding Tool Room Lathe"



Precision Collet work for all sizes to 1-1/16" Collet seats *directly* in spindle.

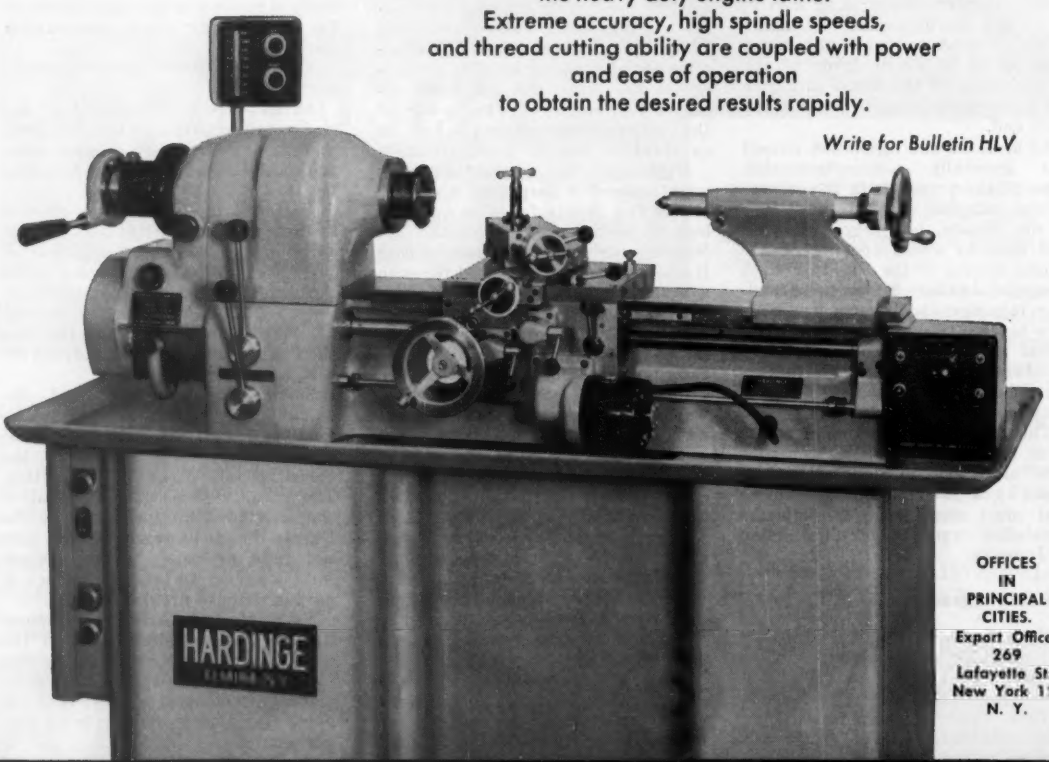
Precision Step Chucks for diameters up to 6". Provides Collet-like accuracy.



Integral Mount Jaw Chucks for precision holding of regular or irregular shapes up to 5".

Hardinge Model HLV 10" Lathe was primarily designed to fill a very old existent gap between the plain precision bench lathe and the heavy duty engine lathe.
Extreme accuracy, high spindle speeds, and thread cutting ability are coupled with power and ease of operation to obtain the desired results rapidly.

Write for Bulletin HLV



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HARDINGE BROTHERS, INC., ELMIRA, N. Y.

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MACHINERY
OCTOBER 1955

Now that the Shows Are Over

The shows for the metal-working industry held last month in Chicago were even more spectacular than had been predicted in pre-show publicity. Machines and tooling that can have a tremendous effect on the productive capacity of the nation, and therefore, on its economy as well, were exhibited in abundance. Much of the equipment incorporated new principles intended to promote the efficient manufacture of metal parts. Greater accuracy, higher quality, closer control of inspection, and faster production were features stressed in practically every machine tool booth.

Keen interest on the part of potential users was aroused by the exhibition of machines and tools in operation under simulated shop conditions. Machine tool and other equipment manufacturers, however, must remember that few sales will result from expressed interest alone. An aggressive sales campaign on the part of every equipment manufacturer will be necessary in order to cash in on the show investment. In most cases this investment was substantial and considerable business must be developed to insure a profitable return.

Today's problem for machine tool builders and other equipment manufacturers is not production—most of them have capacity for turning out their products in far greater quantities than they were able to sell during the last couple of years. The big problem now is to sell their products to the people who need them, but who, for some reason or other, will not buy unless the advantages that can be obtained with the new equipment are brought to their attention time and again.

To achieve this goal, manufacturers are largely dependent upon their sales staff and publicity programs. They should make certain that the sales staff has capable men who can intelligently discuss the problems of the potential customer and also clearly explain the details and advantages of the new equipment. The sales engineers of the machine tool concerns that exhibited in Chicago will, in most cases, have a real job to learn the important facts about all the equipment that was introduced for the first time. That is because of the complexities of the many new designs. But learn these facts they must, if the developments are to be successfully marketed.

It goes without saying that the efforts of the sales engineers should be adequately supported by advertisements and editorial descriptions in technical magazines, because through these mediums the interest of potential buyers can be most readily developed and maintained. Descriptive literature in the form of catalogues and circulars should be made available to the salesmen as soon as possible.

The old adage about beating a path to the door of the man who makes the best mousetrap, seldom holds true these days. There are too many competitors in the field who build equipment around which they can also establish good selling arguments.

Charles O. Herb

EDITOR

What's New

IN STEEL FROM STOCK

In the news today are many developments of interest to those who specify, buy or work with steel. Ways in which you can raise efficiency and lower costs in your operations may be suggested by the following summary.

Leaded plates—Now lead has been added to E-Z-Cut plate. As a result, E-Z-Cut, which was already considered one of the best free-machining plates on the market, is better than ever. Tests show that New E-Z-Cut cuts even faster, takes a sounder weld and polishes to a better finish than non-leaded E-Z-Cut. And because sulphur content is much lower, New E-Z-Cut is much cleaner steel, free from sulfide stringers. First stocks include thicknesses up through 3".

Biggest stainless steel plates now available from Ryerson stocks. This is the first time that 96" wide plates in thicknesses up to and including 1"—and heavier plates in 80" widths have been carried in stock at plants from coast to coast. Types on hand: 304, 304L, 316 and 316L. Next time, save welding on your big jobs with these bigger plates.

Delivered prices on tubing—Something new in simplified pricing is featured in a booklet just published by Ryerson. For buyers in the 16 metropolitan areas where large Ryerson tubing stocks are located, the booklet gives total delivered prices. There's no figuring to do—no factors to add. For buyers outside these metropolitan areas, a separate book gives prices per 100 feet and transportation charges. And beside every price in all books is a figure that tells you quickly and clearly when you can get a lower price by ordering just a few feet or pounds more. Copies on request.

Give steel-walled buildings a new look with stainless steel siding in mansard pattern, now available for quick shipment from Ryerson. (Galvanized and carbon steel sheets in mansard pattern also available.) The mansard pattern of widely spaced corrugations makes an unusually attractive wall and loss in total sheet area from pattern formation is slight—only about the same as with $2\frac{1}{2}$" corrugated—previously the most economical pattern you could use. Maintenance-free stainless in mansard pattern also has many industrial and miscellaneous-architectural-ornamental applications. New Bulletin 70-5 on request.

New sizes of leaded alloys—Increasing demand for New Rycut 50, fastest machining .50 carbon alloy steel, has prompted Ryerson to increase the range of sizes in stock. Hot rolled rounds, both annealed and heat treated, are now available in large sizes—up through $9\frac{1}{2}$". So heavy shafting, gears, cams, etc. can be produced at savings possible only with Rycut alloys.

Stainless pipe for welding applications—Now there's no need to wait for mill deliveries or to use expensive stabilized types when you want stainless pipe suitable for welding. Type 304L pipe, an extra low carbon type that eliminates the need for stress relieving after welding, has recently been added to Ryerson stocks. Size range: Schedule 40 welded pipe in commonly used sizes from $\frac{1}{4}$" through 2". Schedule 40 seamless in 3", 4" and 6" pipe sizes.

Supply situation on bars, structurals, plates and sheets—Heavy demand makes it difficult to keep all sizes of these products always on hand. However, we do have thousands of tons of steel ready for quick shipment and, since our stocks are being replenished continually, sizes that are not available today may be on hand tomorrow. So call us next time you need steel.

RYERSON CERTIFIED STEELS

JOSEPH T. RYERSON & SON, INC. PLANTS: NEW YORK • BOSTON • PHILADELPHIA • CLEVELAND
CHARLOTTE • CINCINNATI • DETROIT • PITTSBURGH • BUFFALO • CHICAGO
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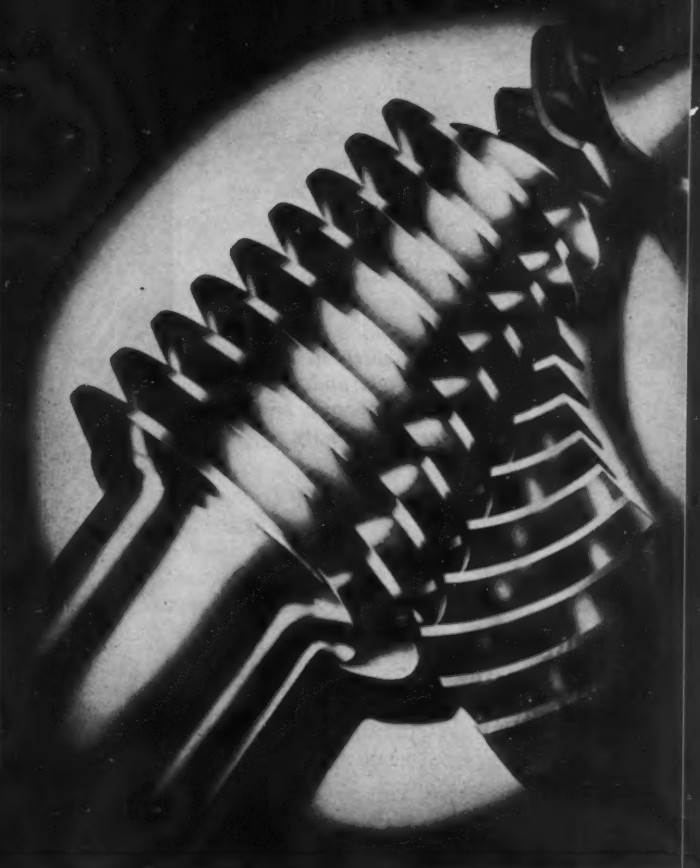
SPIROID GEARS

A New Development In Gears of the Skew-Axis Type



Spiroid gears are skew-axis gears of relatively high speed-reduction ratio which permit outstanding weight and space economy, and simplify assembly and mounting problems. This article is based on a paper read at Thirty-Ninth Annual Meeting of the American Gear Manufacturers Association

By FRED BOHLE, Manager

Machine Tool Development Department
Illinois Tool Works
Chicago, Ill.

DEVELOPMENTS in the field of gearing in the last twenty-five years have been largely in the direction of improving the performance characteristics of known types and designs of gears. Great strides have been made in producing better gears through higher accuracy, better materials and heat-treatment, refinement in design, and improved lubricants. The last significant addition to the family of gears appears to have been the hypoid gear. Also, if patent art is any indication, the period in which hypoid gears made their appearance seems to have been the last time that engineers tried seriously to invent new gears.

Spiroid gears, developed by the Illinois Tool Works and seen in Fig. 1, are a recent addition to the family of skew-axis gears. They provide gear designers with a new and very practical area for the position of their gear axes. The position as such, might be interesting only in certain isolated design situations. However, the important fact is that by locating the pinion axis in the shaded area shown in Fig. 2, some startling results are obtained.

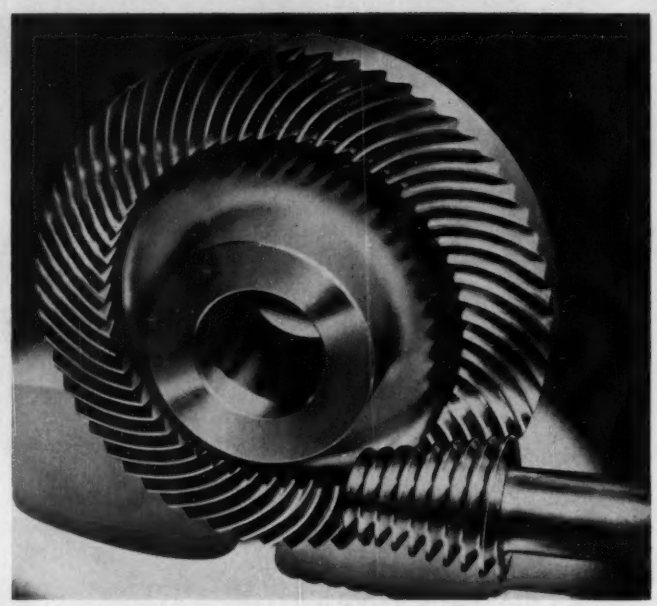


Fig. 1. Spiroid gears have many more teeth in simultaneous contact and, therefore, greater torque transmission capacity

The most outstanding of these results is the fact that Spiroid gears have many more teeth in simultaneous contact. Therefore, they have more torque transmission capacity per pound of weight or inch of diameter. Expressed differently, they present outstanding weight and space economy in gear train or speed reducer design. Furthermore, they simplify assembly and mounting problems and offer a new approach for the control of backlash and play. Also, in spite of their complex appearance, they are relatively easy to produce. Their characteristics of performance, their field of usefulness, and their efficiency are comparable to other members of the skew-axis gear family, particularly the worm-gears.

Spiroid gears do not compete with crossed-axis (bevel) or parallel-axis (spur and helical) gears. Skew-axis gears are sometimes called screw type gears, while bevel, spur, and helical gears are referred to as rolling contact gears. This comparison takes into account the degree or the amount of sliding which occurs between engaging tooth surfaces.

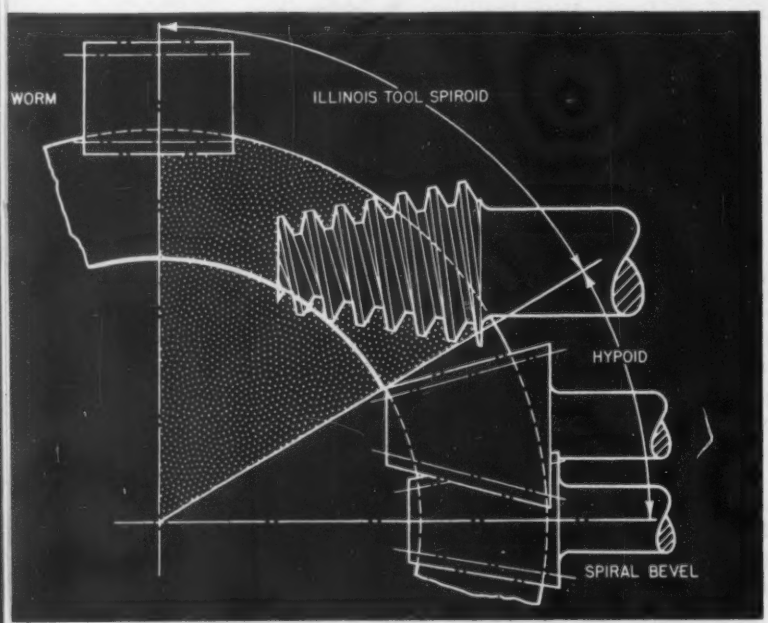


Fig. 2. By locating the pinion axis in area indicated by shading, Spiroid skew-axis gears have more torque transmission capacity

The difference between rolling and sliding contact gears may be illustrated by the two common tools for lifting heavy weights: the jack-screw and the crowbar. Of the two, the crowbar is the more efficient but it is also limited in ratio as well as in some other respects. Jack-screws have not done away with crowbars, or vice versa. A similar status of coexistence holds true of screw type gears on the one hand and bevel, spur, and helical gears on the other. Over the years, definite fields of application have developed for each type of gear. Spiroid gears occupy the field which was, up to now, the exclusive property of worm-gears.

As illustrated in Fig. 3, the increased load carrying characteristics of Spiroid gears are primarily due to the larger number of teeth in simultaneous contact. In the conventional ratio range presently handled by worm-gears—from 10:1 to 60:1—Spiroid gears have from three to four times more teeth in contact. However, their performance under these greatly increased loads is further enhanced by the nature of the contact between pinion and gear and the radius of curvature at the contacting lines.

In Spiroid pinions the line of instantaneous contact is practically perpendicular to the direction of sliding velocity, resulting in a full sweep of contact on the pinion and the perfect formation of an oil film, as seen in Fig. 4. The radius of curvature at the lines of contact is considerably greater than on worm-gears of approximately the same size. When driving in one direction, contact is between two convex surfaces. In the other direction it is between a concave and a convex surface.

Not only is there a difference in the relative radius of curvature between contacting tooth surfaces, depending on the direction of rotation, but there is also a difference in pressure angle. Therefore, Spiroid gears are not symmetrical gears. Neither the contacting surfaces nor the magnitude and direction of the driving forces are the same. While the forces are largely in the axial direction of the pinion—particularly in the higher ratio range—they do have a component which subjects the pinion shaft to bending in the direction of separating the pinion and the gear. This component is higher when the high side of the pinion tooth does the driving. Therefore, if the load carrying rotation of a Spiroid gear set is in one certain direction, it appears preferable, in the interest of pinion strength and bearing life, to let the low side of the pinion tooth do the driving.

The upper ratio limit for worm-gears (about 75:1) is determined by the same considerations which confine the ratio range for spur, helical, bevel, and hypoid gears to less than 8:1. When using the minimum proportions for worm or pinion, the mating gear becomes too large. Higher reductions are therefore handled more economically by multiple ratios. The upper ratio limit for Spiroid gears does not suffer from the same handicap. For any given gear diameter, a higher ratio means a shorter lead or smaller

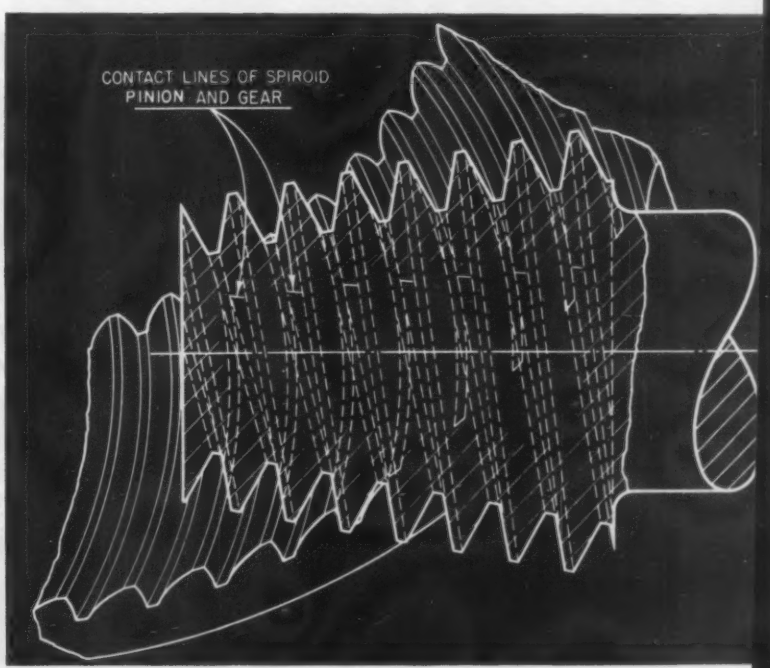


Fig. 3. Large number of teeth in simultaneous contact is primary reason for increased load carrying capacity of Spiroid gears

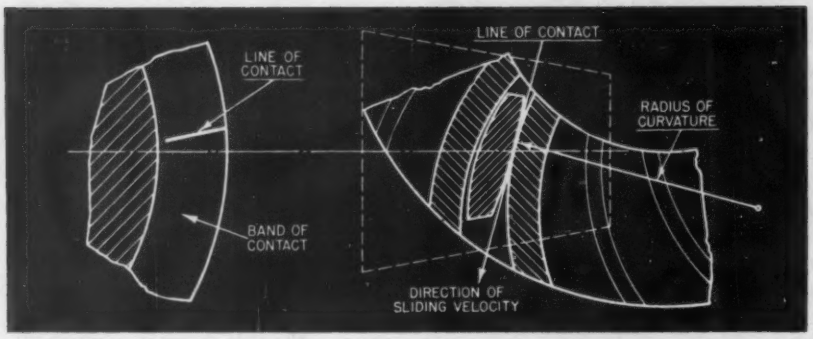


Fig. 4. Line of instantaneous contact in Spiroid pinions is practically perpendicular to direction of sliding velocity

pitch. Inasmuch as contact extends over the entire length of the pinion, a shorter lead means a proportionately increased number of teeth in simultaneous contact.

This particular characteristic of Spiroid gears allows a perfectly valid comparison to coarse and fine pitch screw threads. With the same nut length, fine pitch screws allow higher tightening torques at no sacrifice in strength. Their number of teeth in engagement is increased in proportion to the reduction in pitch. For any given Spiroid gear size, strength is not a limitation of ratio. Ratios of 300:1 and more are readily handled in one pair of gears at, of course, a sacrifice in efficiency.

The efficiency of Spiroid gears follows the pattern for worm-gears, and is typical of all skew-axis, sliding-contact type gears. For any one fixed gear size and center distance, efficiency is roughly proportionate to ratio and pinion diameter. In the ratio range below 25:1, the efficiency of Spiroid gears becomes increasingly superior. To what extent the nature of the contact with its ideal oil film formation contributes to this improved efficiency is not known at this time. However, for any given input shaft diameter, the average diameter of a tapered Spiroid pinion is usually smaller than that of a cylindrical worm. Furthermore, the force created by the friction between Spiroid pinion and gear helps rotation, while in worm-gears it always opposes it, as seen in Fig. 5. There are no simple efficiency values for Spiroid gears. Efficiency depends not only upon the ratio and size of the gears but also upon the sliding velocity. For any one given pinion, efficiency depends on the input speed.

Except for the continuous transmission of large horsepower equivalents and certain other applications where the power supply is critical, users of gears are not so much concerned with

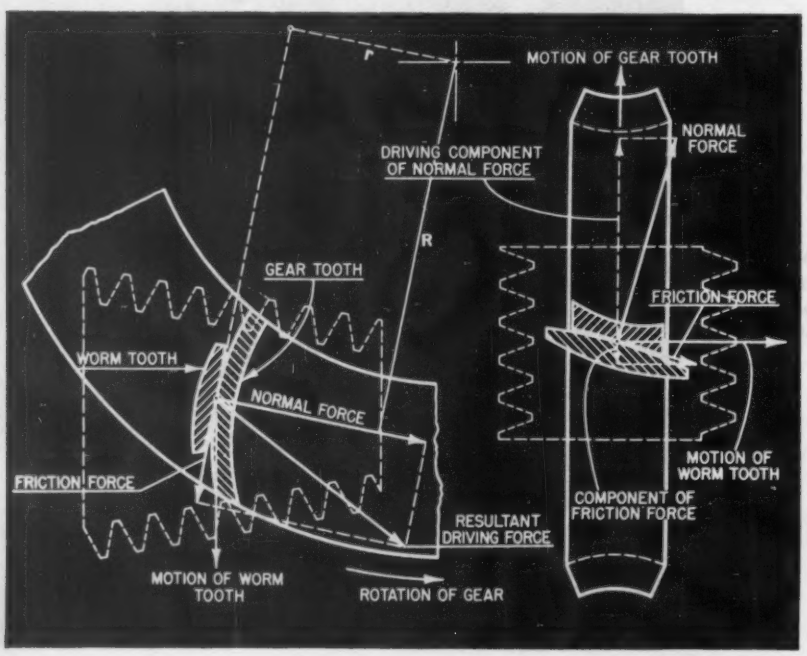


Fig. 5. Force created by friction between Spiroid pinion and gear (left) helps rotate gear

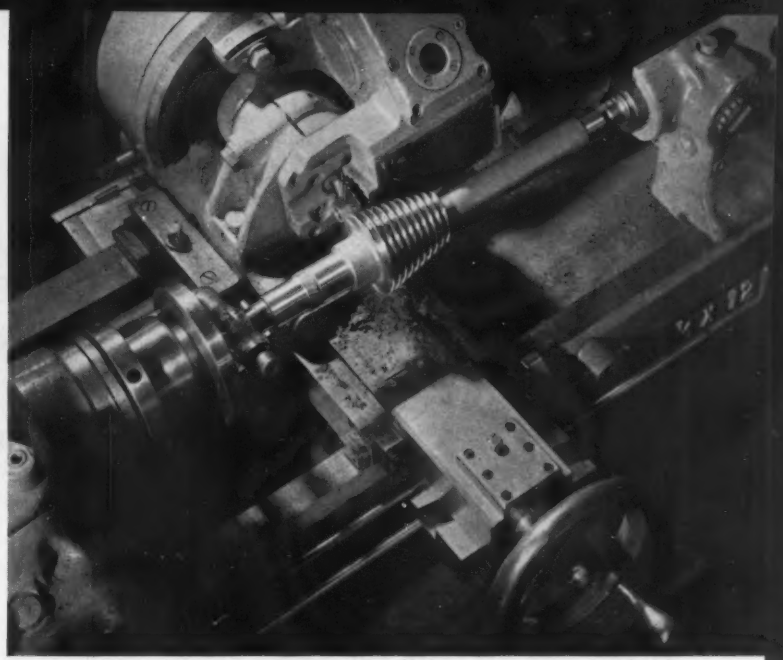


Fig. 6. A standard thread-milling machine modified by addition of a fixed angle-block is used for the production of Spiroid pinions

efficiency as they are with the degree of inefficiency. The difference between input and output horsepower is turned into heat which must be dissipated. Once they are mounted into a housing, the capacity of the gear to transmit power continuously is limited by the ability of the housing to dissipate heat. In ordinary speed reducer design, that limitation is far below the torque loads which the same gears could transmit in interrupted service, or generally, in all applications where heat is not the limiting factor.

Spiroid gears have a high power transmission capacity per inch of diameter. Also, because of the reduced center distance between gear and worm, the housing for a Spiroid gear set can be compact in size.

Spiroid pinions are tapered pinions with constant lead and pressure angle over their entire length. The taper is not related to either ratio or center distance. In the interest of maximum tooth bearing, it is fixed at 10 degrees on the side, or 20 degrees included angle. Only in certain cases are smaller taper angles used, usually for reasons other than tooth bearing. Spiroid pin-

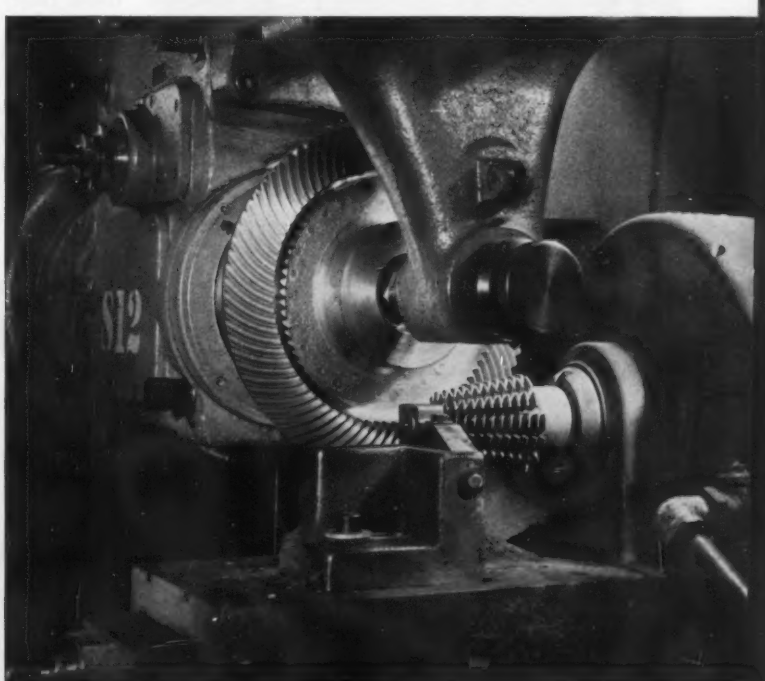
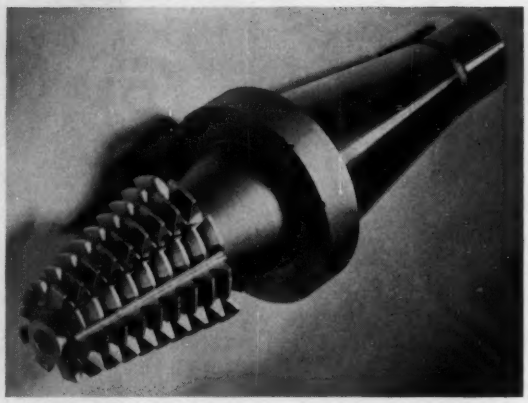


Fig. 7. Spiroid gears can be generated on standard hobbing machines without the need for any modifications or alterations

Fig. 8. Hob for generating Spiroid gear is made like the pinion with the exception that it is longer to compensate for sharpening.



ions differ from ordinary worms only by the addition of the taper, and they are produced on the same machine tools and by the same techniques as worms. The addition of a fixed angle-block will convert any standard thread-milling machine for the production of Spiroid pinions, as shown in Fig. 6. The same holds true for thread grinders which use small diameter grinding wheels.

The Spiroid gear is generated by a hob in a standard hobbing machine, Fig. 7. Standard hobbing machines may be used without any modifications or alterations. However, if used as they are, they will be limited to a smaller size range. The replacement of the hob slide by one with a greater offset will enable any hobbing machine to cut Spiroid gears to the full limit of its size range. The hob, Fig. 8, is like the pinion in every respect—except longer. However, it is not merely longer in order to overlap the cutting zone. Length is added at the large end primarily to compensate for the loss of size due to sharpening, as illustrated in Fig. 9. This constitutes a great manufacturing advantage.

It appears that the improved performance of Spiroid gears need not be bought at the expense of higher manufacturing costs. If the pinion becomes somewhat more expensive because smaller grinding wheels are recommended, the production cost of the gear is lowered by the efficient hobbing cycle and by the absence of the size problem between hob and pinion. The technique is in matching the hob to the condition of the pinions, as these pinions are produced by the simplest grinding and wheel dressing routines. Hob makers are familiar with such matching problems because they also occur with ordinary hobs as they lose size due to cam relief.

It has been illustrated that contact between the Spiroid pinion and gear is along lines which are virtually in a radial direction on the pinion teeth. It has also been mentioned that the pinion teeth or threads are of constant lead and pressure angle. As a result, the pinion is very insensitive to axial positioning, and the same is true of the position of the gear along its axis. Adjustments in either the gear or pinion along their respective axes merely affect backlash, Fig. 10, and, to a minor extent, the length of the lines of contact.

This adjustability leads to new opportunities for the control of backlash and play. There appears to be no other type or kind of gear which holds the same promise in such a simple and direct way. This characteristic is important for all those indexing drives which require reversal of rotation at a minimum loss of relative position, and those drives which must not only rotate but hold in either direction at a minimum of play. In many of these applications the no-play requirement is combined with a demand for ruggedness and strength which is also a typical characteristic of Spiroid gears.

In general, Spiroid gears seem to be ideally

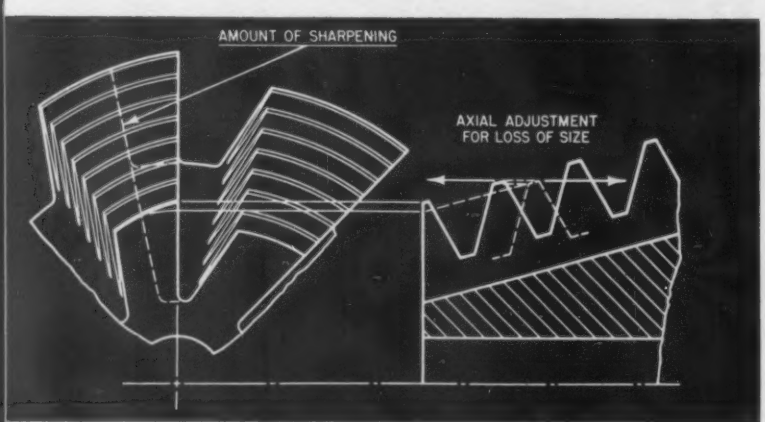


Fig. 9. Amount of sharpening on Spiroid gear hob is indicated at left, while corresponding axial adjustment to compensate for decrease in size is seen at right

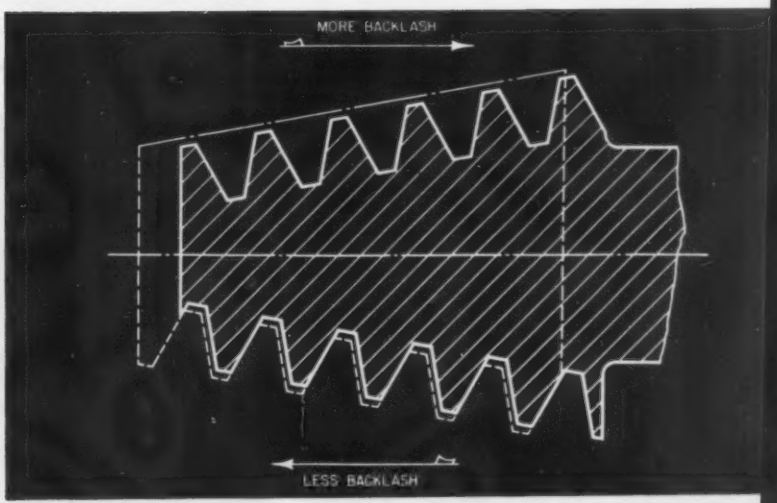


Fig. 10. Spiroid pinion is insensitive to axial positioning. Movement of the pinion along its axis in either direction provides more or less backlash as indicated

suited for all those drives where high accuracy of rotation is the goal. One of the great obstacles to high indexing accuracy is the control of run-out. Spiroid gears, like all other gears, are located from their bores or shafts. However, as a rule they are clamped and held by their back faces during hobbing. This is generally a relatively large and easily controlled surface on the gear as well as on the hobbing machine. Whatever radial run-out is present after hobbing and mounting has less effect on rotational accuracy and play because the gear operates on the side of the pinion. The same holds true of the effect of differential thermal expansion, as the temperature of gear and housing varies in service.

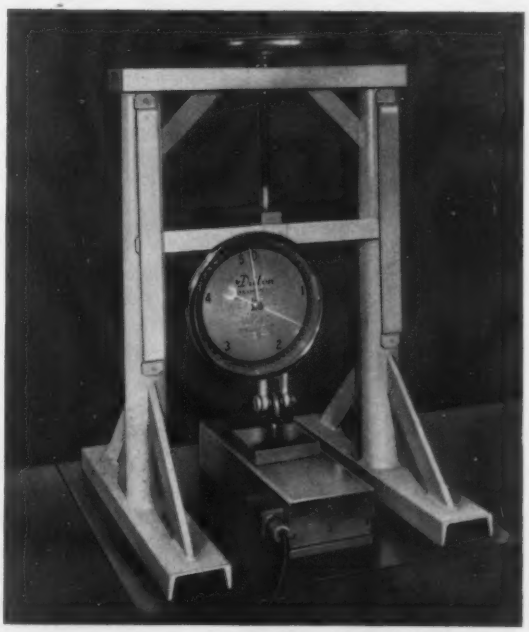
Whether it is for high indexing accuracy, near-zero backlash control, high torque to weight ratio, high ratios in a single set of gears, or just doing the multitude of everyday jobs, Spiroid gears appear to have a promising future.

Dynamometer Tests Holding Power of Magnetic Chucks

The holding power of magnetic chucks is measured by using a test device with a Dillon dynamometer at the Sundstrand Magnetic Products Co., Rockford, Ill. As shown in the illustration, the simple, inexpensive set-up consists of a traction type dynamometer, a rectangular steel frame, and a power screw and handwheel.

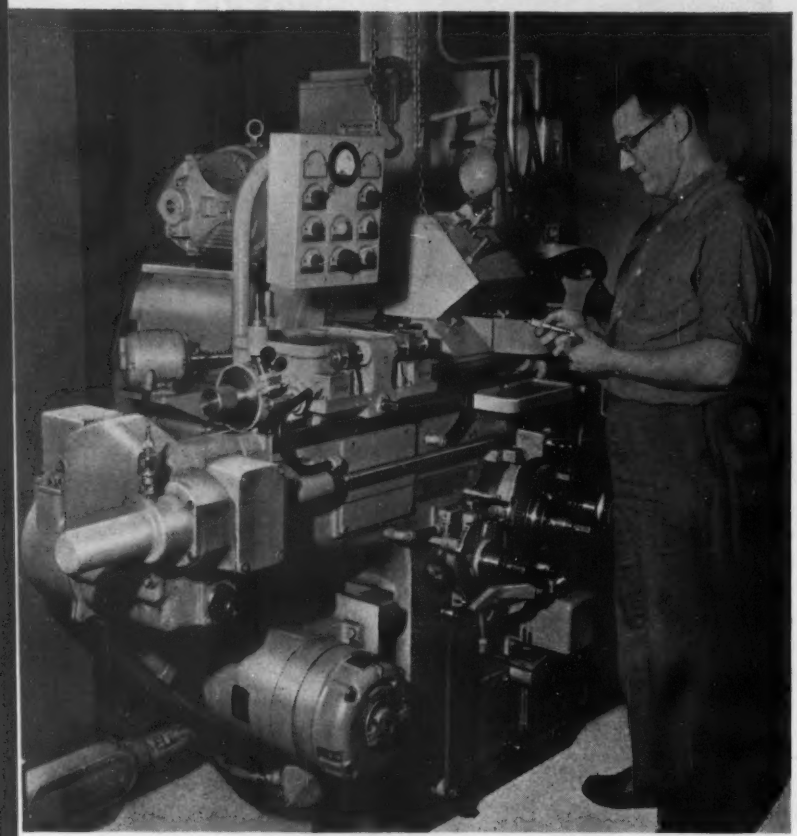
In performing the test, the chuck is secured firmly at the base of the frame. A steel block is connected by an eye screw to the dynamometer which is attached to the power screw. While the block is magnetically held to the chuck, an attempt is made to raise the block by turning the handwheel. The amount of force necessary to separate the block from the chuck is instantly indicated in pounds on the dynamometer dial.

The dynamometer used in this test is of 5000 pounds capacity. Similar instruments are available in twelve other capacities up to 100,000 pounds. All are capable of sustaining a 25 per cent overload without injury to the calibration. Clevises and pins are standard equipment with all ranges.



Holding power of a magnetic chuck is tested by a dynamometer positioned in series with a power screw and magnetically held block

Glass Tubes Machined to



Coil forms for a telephone transformer are fragile, thin-walled glass parts requiring radically different manufacturing methods, as well as special and modified machines, to hold dimensional tolerances as close as 0.0001 inch

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TRANSFORMERS for the line and station amplifiers of a coaxial telephone system must be manufactured under precise control in order to minimize variations in their operational characteristics. To satisfy the requirements imposed upon the transformers, extensive use has been made of parts machined from ceramic and high silica content insulating materials. This necessitates new manufacturing methods radically different from those usually associated with transformer production.

Coil winding forms for the transformers are made from Vycor, a 96 per cent silica glass. While this material is very hard, the parts themselves, seen in Fig. 1, are thin and consequently fragile and easily distorted. In fact, they can be distorted by more than the specified tolerance simply by holding them between one's fingers. The wall thickness of 0.031 inch between the inner diameter and the bottom of the threads on the glass outer winding form (seen at the bottom) must be held to limits of plus or minus 0.0005 inch. Also, the same tolerance must be maintained on the concentricity of the cylindrical inner and outer surfaces of this same part.

Tolerances specified on the inside bores of the parts vary from plus or minus 0.001 inch on the inner form (top), down to plus or minus 0.00015 inch on the form for the outer winding. In actual practice, however, this latter dimension is held to plus or minus 0.00005 inch to satisfy a subsequent requirement that the wall thickness of production lots must have a random distribution.

Such close tolerances, and the fragility of the thin-walled glass parts, made it imperative that tubing appreciably thicker than the finished product be used as raw material. This made possible the accurate honing of the inside diameters, and the use of these surfaces as bases for holding all other dimensions of the parts to the precise tolerances required.

In preparing the glass tubing, the material is preshrunk in a plastic state at elevated temperatures around an accurately ground mandrel. In this way, the bores of the glass tubes are reduced to within 0.001 to 0.002 inch of their final sizes.

Extremely Close Limits

The keyways required in the inner forms are made by this same process, and no further machining of these surfaces is required.

Honing of the coil-form bores is performed with the set-up seen in Fig. 2, using a fine-grit diamond hone held in a steel mandrel with an adjusting wedge. Rough-grinding of the outside diameters to plus or minus 0.001 inch, and facing of the ends to meet the plus or minus 0.003 inch tolerance on over-all length of the parts, presented no particular problems. However, an Arnold gage is used to give a continuous indication of the outside diameter during grinding.

Special machines such as the one shown in Fig. 3 are used for the notching, slotting, and trimming necessary in forming the lead-in grooves, slots, and tabs on the glass coil forms. Cutting is done with fine-grit, diamond abrasive wheels, locating the work-pieces from their previously honed bores in an accurate indexing fixture. An angular tolerance of plus or minus 30 minutes is held in the radial location of the slots in the end of the inner form, and the radii of fillets at the bottom of the slots must not exceed 0.015 inch.

Undercutting of the inner and middle forms (top and center in Fig. 1) to produce the spacing shoulders on these parts is a straightforward cylindrical grinding operation, also performed with a diamond wheel. Tolerances on the width of the shoulders are plus or minus 0.003 inch, while those of the part diameters are plus or minus 0.001 inch.

Grinding of threads on the inner and outer forms prior to the application of the plated copper windings was a major manufacturing problem. The finer of the two threads is on the outer winding form and has an 88 pitch, with exactly 50 turns required. These threads have a 14 1/2-degree Acme form, with a depth of 0.005 inch, a

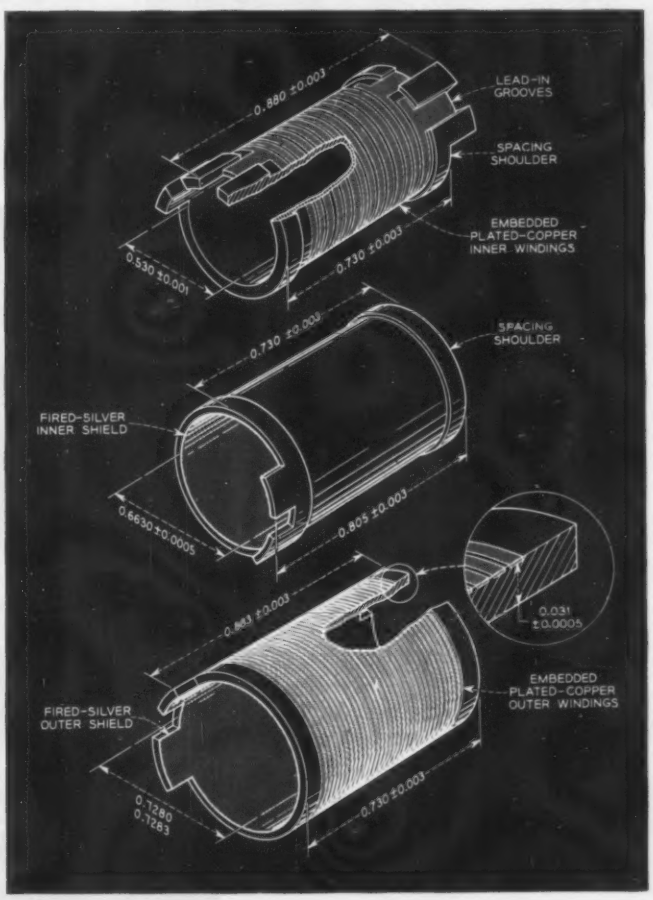


Fig. 1. Inner, middle, and outer coil winding forms (shown at top, center, and bottom, respectively) are made from Vycor, a 96 per cent silica glass.

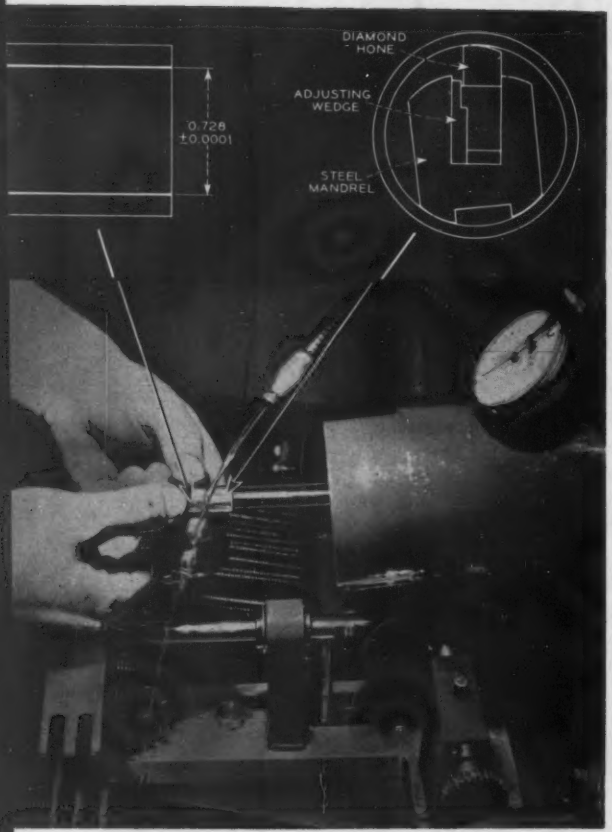


Fig. 2. Bores of glass winding forms are first honed to permit accurate location for maintaining precise tolerances in subsequent machining.

width at the top of 0.0070 inch (plus or minus 0.0006 inch), and 0.0015 inch maximum radii in the corners. Their root diameters must be maintained within plus or minus 0.0005 inch of the specified size.

Production of an experimental lot of transformers on a specially equipped toolmaker's lathe indicated that the best way to obtain the uniform control desired was through the use of an automatically cycled thread-grinding machine. Other methods, including a novel approach in which the threads were formed by a high-frequency vibration process using a powdered abrasive cutting agent, were either too slow or inherently did not have sufficient controls to yield the required uniformity.

A Jones & Lamson automatic thread grinder, seen in the heading illustration, was selected for these difficult operations, but the manufacturer had to modify the machine to suit the application. Also, considerable development was required to work out the required techniques for the process. One of the problems was to adapt the grinder to permit use of a metal-bonded diamond wheel in place of the resinoid-bonded diamond or sili-

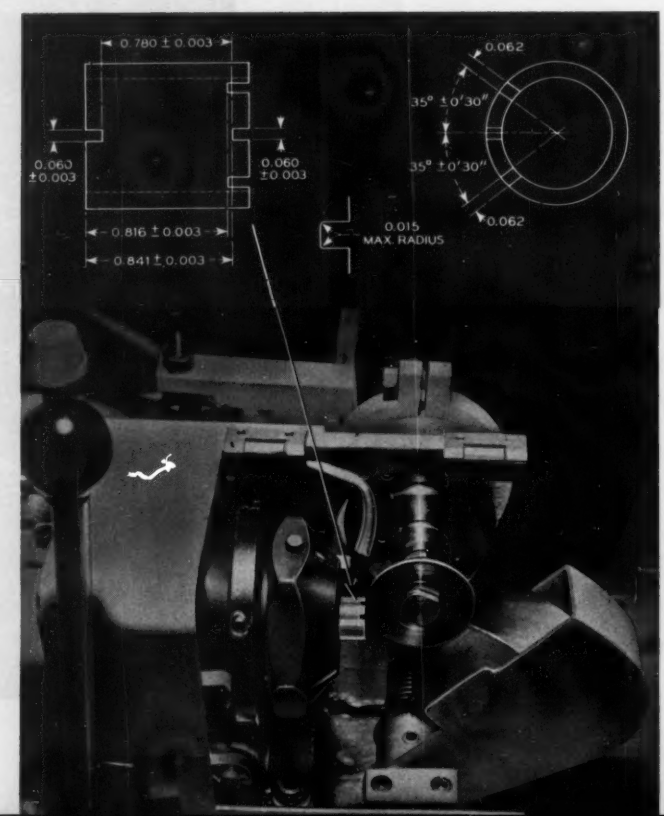


Fig. 3. Special machine for forming lead-in grooves, tabs, and slots on coil forms. Cutting is done with a fine-grit, diamond abrasive wheel.

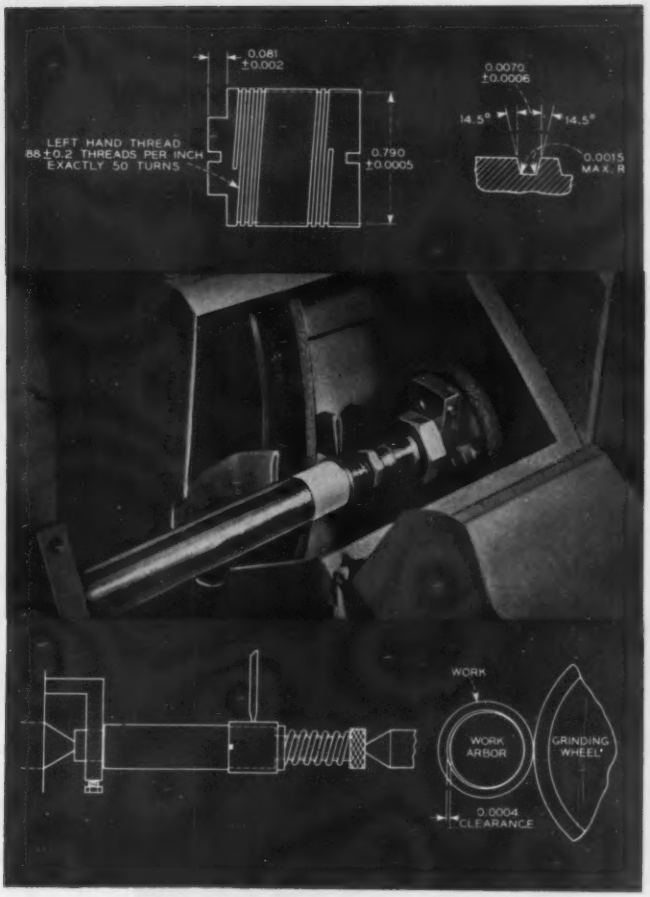


Fig. 4. This close-up view of the thread-grinding operation shows how glass winding form is held on an arbor, between centers, by means of a spring-loaded washer.

con carbide wheels conveniently employed for thread grinding.

This is believed to be the first time that metal-bonded wheels have been used on this type machine. Factors leading to the selection of such wheels were the necessity for holding as nearly square a thread as possible and the extremely hard abrasive nature of the material being worked. Specially designed scrubbing wheels made from silicon carbide have been provided for dressing and sizing the diamond wheels. A unit has been built into the machine for automatic dressing of the wheel to the shape required after completion of a predetermined number of parts. The diamond wheels need not be removed from the machine. The scrubbing wheels are supported by pre-loaded ball bearings, instead of the conventional sleeve bearings, for increased rigidity under the high pressure exerted.

Selection of the proper grain size for these diamond wheels was also critical. Wheels having grains coarser than 300 grit were found to cause excessive chatter and breakage of parts when used to grind fine threads in the Vycor. Speed of approach and retraction of the wheel, controlled by a specially shaped forming cam, had to be carefully worked out to control thread starting and run-out (factors affecting transformer performance), and to minimize parts breakage. Precise control of the depth to which the grinding wheel is fed is obtained by dial indicators having a sensitivity of 0.0001 inch. During thread grinding, the glass winding form is held on an arbor, Fig. 4, with the work-piece located against a shoulder on the arbor by means of a spring-loaded washer pressing against the opposite end. The arbor is mounted between centers on the grinding machine, and provides a clearance of 0.0004 inch between the bore of the work and the periphery of the arbor.

To provide as desirable working conditions as possible, all of the grinding machines with the exception of one used for rough work are located in a dust-free air-conditioned room. In the case of the thread grinder, it was found necessary to take the further precaution of warming up the machine for a minimum of one and one-half hours prior to using it, and to provide more rigid

guards in place of standard equipment in order to reduce vibration.

The inner surfaces of the middle and outer Vycor winding forms, as well as those of the ceramic coil housings, must be silvered for shielding purposes. Also, the outer surfaces of the inner and outer coil forms are similarly processed to provide a base for the plated copper, which, in combination with the silver, forms the actual coil windings. It is imperative that these coatings be uniform in density and thickness, and have a strong, dependable bond.

A finely ground silver powder, suspended in a lacquer solvent with small amounts of resin and glass grit, is used as the silvering agent. The agent is sprayed on the parts under carefully controlled conditions in specially developed machines, and the organic material is driven from the mixture by firing at 1250 degrees F. in a continuous-belt refractory furnace. Thickness of the coating is controlled by weighing and uniformity is improved by the application of two coats. To improve the continuity and conductivity of the coating, the parts are burnished by wire brushes.

Threads which form the windings of the transformers are produced by plating copper on top of the fired silver on the outer surfaces of the inner and outer forms. The problem of applying a homogeneous, triangular ribbon of copper in the narrow grooves on the outer surfaces without loosening the silver bonded to the Vycor forms was solved by reverse plating.

Initially, the parts are given a flash of copper in a copper sulphate bath to protect the fired silver from attack by the copper fluoborate bath subsequently used to permit rapid application of the heavy plating required. To keep a fresh solution in the threads, and provide a uniform coating, the parts are rotated during plating. The anodes are enclosed in closely woven Vinyon or Dynal bags, and the solution is purified daily by filtering after treatment with activated carbon.

Simultaneous removal of copper and Vycor in the final dressing of the parts after plating for the transformer windings is performed on a Brown & Sharpe cylindrical grinding machine, Fig. 5. For this operation, a wheel had to be selected which would cut with very light pressure so as not to break the brittle Vycor form, and, at the same time, not load up with copper from the windings. The most practical one found for this purpose is a vitrified-bond, silicon carbide wheel of 220 grain size and I grade. Wheels with a stronger bond tended to cause excessive parts breakage, while softer ones broke down so rapidly that the required tolerances could not be held.

Measurement of the wall thickness of the outer forms at the root diameter was a problem because the measurement has to be made from a cylindrical surface in one plane to a point at the bottom of a narrow thread in a plane at the helix angle of the thread. At this point, the Acme thread is only about 0.004 inch wide, including the 0.0015 inch radius fillet in each corner. This problem was solved by inserting a thin diamond blade in the thread, and comparing the distance from the bottom of the blade to a circular rod supporting the cylindrical form with a flat, ground carbide thickness gage. Consistent results with an accuracy of 0.0002 inch are attained.

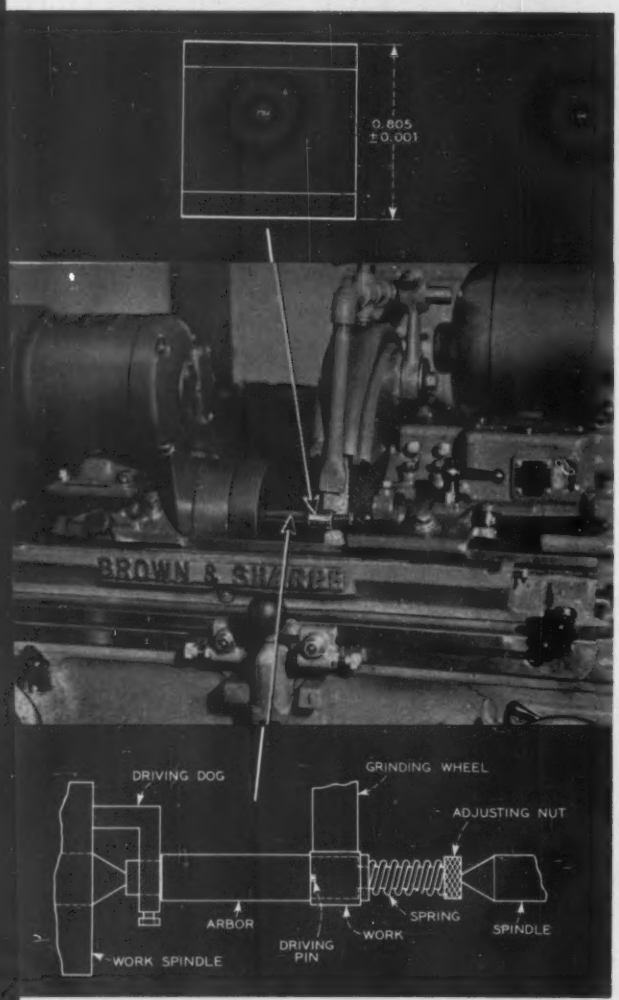
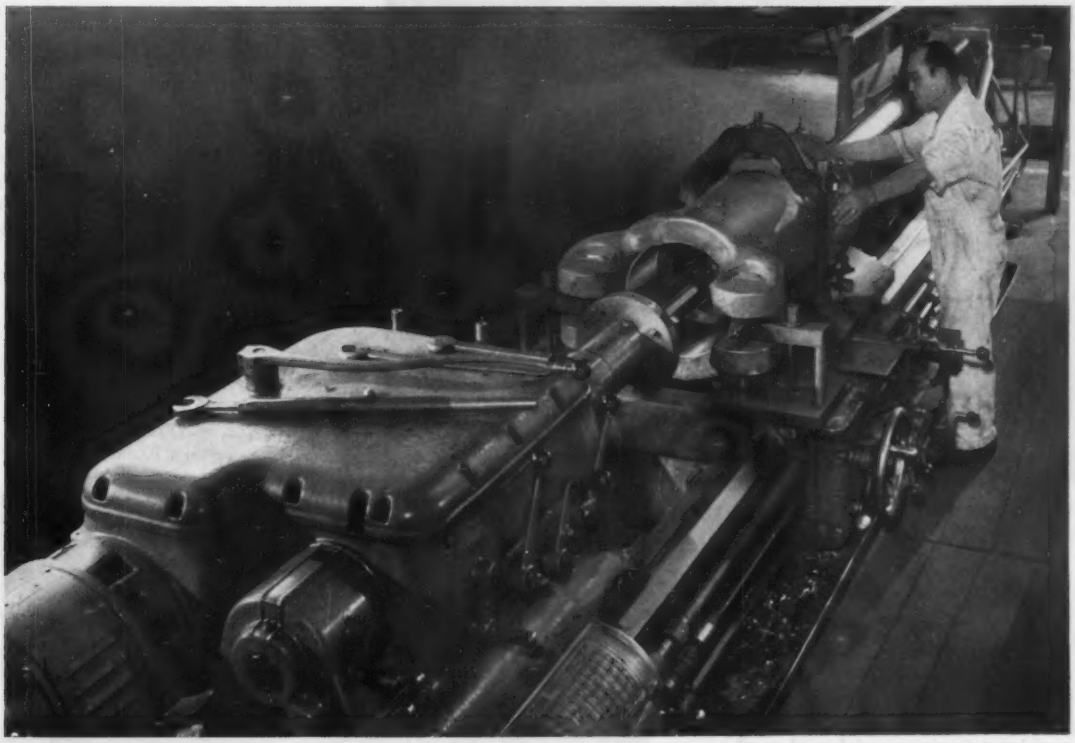


Fig. 5. Cylindrical grinding machine used for final dressing of winding forms after they have been copper-plated to provide transformer windings.



Heavy-Duty Boring on an Engine Lathe

THERE are times when the most obvious way of performing a machining operation can also be the most expensive way. Take for example, the boring of triplex and duplex oil-well hook housings at the plant of Byron-Jackson Co., Los Angeles, Calif. These housings are cast from SAE 1040 steel in sand with a cored center hole and they weigh up to 800 pounds. The casting contains considerable sand which results in a difficult machining job.

Originally this housing was machined on a boring mill having a 5-inch tool-bar. Although the machine was efficiently tooled, including holding fixtures for the work that reduced set-up time to a minimum, the operation was long, and the expensive equipment was tied up for long periods on the one job.

An investigation was made with the view to finding a faster, less expensive method of handling this work. As a result the job has been assigned to the Axelson 32-inch heavy-duty lathe shown in the heading illustration. The housing is held in a fixture mounted on the carriage as seen in Fig. 1, the compound rest and tool-slide having been removed from the lathe. One fixture is designed for holding three different parts. A smaller fixture of similar design has been provided for a housing of lesser dimensions. Both fixtures accurately align the work and provide a simple, fast method for clamping it in place.

A two-piece boring-bar was specially designed for this operation. One section is bolted directly to the spindle nose as shown in Fig. 2. It includes two tool-heads designed for accommodating quick-change boring tool bits. The second section of the boring-bar telescopes into the first section. It is supported on the bedways in anti-friction bearings that provide a rigid support in heavy boring and facing operations. The second section of the boring-bar is connected to a hydraulic cylinder that provides a means of quickly retracting or advancing the bar under a push-button control to facilitate loading and unloading of the work.

Fig. 1. (Left) Boring a large cast steel housing in the shop of a supplier of oil-well equipment by using a heavy-duty engine lathe equipped with a special work-holding fixture

Fig. 2. (Right) Close-up view of boring spindle which is constructed in two sections, one of which telescopes within the other

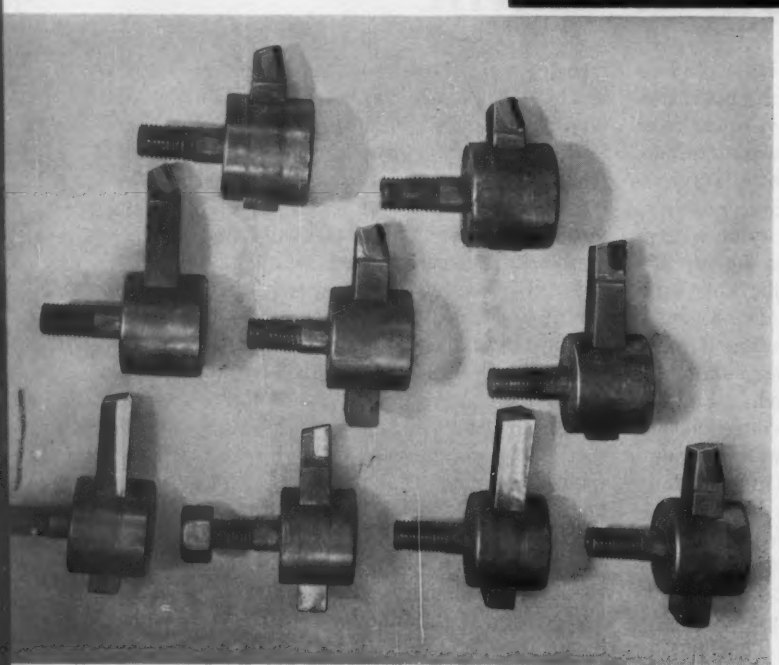


Fig. 3. Nine cutter bits used in boring and facing operations on housing, set up in holders which are quickly interchangeable on a head on the cutter-spindle

Nine different cutting tools are used to complete the part. These are held in individual quick-change blocks as illustrated in Fig. 3. The tool bits are ground and accurately positioned in sets in the tool-room so that the lathe operator does not need to stop the machine for tool sharpening. Five Kennametal bits are used for boring and four high-speed steel bits are used for facing.

In the series of boring, counterboring, facing, and back-facing cuts taken, the roughing feed is 0.016 inch and the finishing feed, 0.019 inch per revolution. The speed of the cutting spindle in roughing is 45 R.P.M. and in finishing, 170 R.P.M. The depth of roughing cuts is 5/8 inch and finishing cuts, 1/8 inch. The floor-to-floor time is three and one-half to four hours.

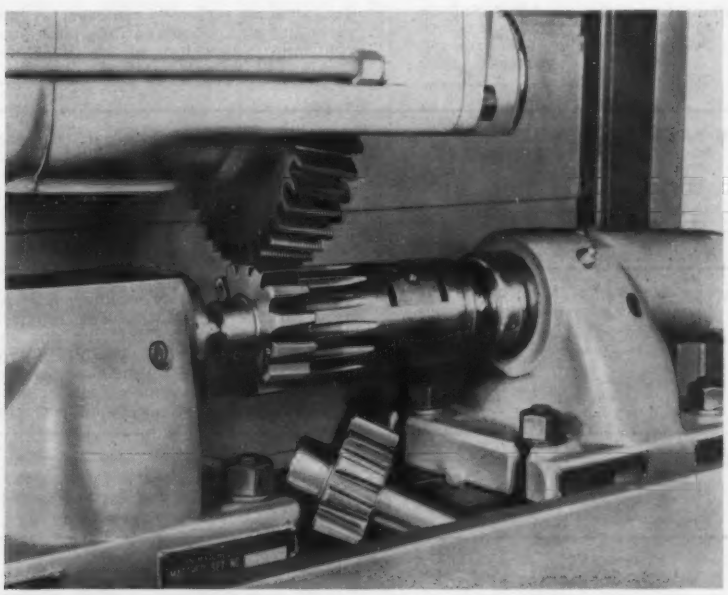
New Process for Shaving Conical Involute Gears

A NEW process for shaving conical involute (tapered-tooth) gears has been developed by the National Broach & Machine Co., Detroit, Mich. The process, which will first be applied to shaving teeth on steering gear segments in automotive power steering mechanisms, makes use of a patented, conical, helical shaving cutter. Shaving can be performed on standard Red Ring diagonal, rotary gear-shaving machines, as shown in the illustration.

Gears produced by this process meet rigid specifications for surface finish, size, and accuracy of tooth taper. Steering gear segments shaved by the process maintain initial backlash settings, and operate smoothly at all steering positions. The segment is mounted in an arbor assembly having steel dummy teeth which complete the tooth circumference of the gear segment. Correct axial location in the work-arbor and dummy-gear assembly is obtained by clamping the gear against the face from which it was generated in the previous gear-tooth roughing operation. Then the gear and arbor unit is mounted between centers in mesh with the cutter. The cutter and work-gear center lines are set at a slight crossed-axis angle for the shaving operation.

Operation of a push-button control on the shaving machine causes the work-gear assembly to feed across the cutter on a diagonal path, at 90 degrees to the center line of the cutter. The work-gear feeds back across the cutter, and the gear and arbor unit is removed, thus completing the shaving cycle.

Cycle time is at least as fast as for any other gear of similar size and tooth specifications produced by the diagonal shaving process. About 0.004 inch of stock is removed from the conical involute gear-tooth thickness during the shaving process. The cutter used to shave the steering gears has a 9-inch diameter, and is about 1 3/8 inches wide.



Close-up shows tapered teeth on rotary shaving cutter and the mounting of the steering gear segment in arbor and dummy-gear assembly

Condensed Review of Some Recently Developed Materials

Arranged Alphabetically by Trade Names

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Aluminum Alloy	A54S	An alloy that exhibits strength at elevated temperatures. It can be welded by all conventional methods; the semi-automatic inert-gas metal-arc process and the inert-gas metal-arc process (tungsten-arc) are preferred, however.	For the construction of unfired pressure vessels in accordance with the rules of Section VIII of the 1952 A.S.M.E. Boiler and Pressure Vessel Code.
Polyester Resin	AR493	A high heat resistance permits its widespread use in electrical applications where high operating temperatures are being used.	Chemical-resistant properties make possible its use on exhaust ducting for chemical fumes, chemical storage and transportation tanks, washer tubs, etc.
Lubricant	Acrawax C Atomized	A finely powdered synthetic wax lubricant, which is non-tacky and non-corrosive. It is insoluble in water, oil, and solvents, and is also a good dielectric.	Used to lubricate very tight-fitting parts such as screws threaded in metal.
Rustproof Coating	Adelphi One Coat Counter-Rust	This material, which is easily applied, isolates and neutralizes minor rust spots.	Steel is protected for periods of from five to ten years upon application of one coat.
Brazing Alloys and Flux	Aircosil Alloys Aircosil Flux	Penetrating action of these materials is fast, resulting in the formation of a small, neat fillet left outside the joint. Bonds are liquid- and gas-tight under pressures and are strong and ductile, withstanding shock, vibration, and wide temperature changes.	The alloys are available in various forms such as rod, wire, sheet, rings and gaskets, and together with the flux can be used to join ferrous, non-ferrous and dissimilar metals.
Paint Stripper	Alk-A-Sol	This paint stripper removes organic resin and pigmented coatings from steel, zinc, and magnesium alloys. It is non-flammable and non-volatile.	It is applied in steel tank baths in varying concentrations in a temperature range of from 100 to 225 degrees F. Treated parts will rinse clean by spraying.
Metal Filler	All-State Metal-Filler	A cold-applicable, waterproof, rustproof, non-shrinkable metal filler that will not crack, chip or peel. It forms a permanent bond with any metal, wood, plastic, or glass, and once applied can be milled, drilled, tapped, ground, and filed.	The filler can be used to repair blow-holes, surface blemishes, and rough porous places in metal castings and metal surfaces; make seams leakproof; repair leaks; and rebuild worn metal surfaces.
Welding Rods	All-State No. 356	These aluminum-alloy welding rods are used for the reclamation and repair of castings both at the foundry and machine shop. Advantages resulting from their use are a low shrinkage factor, good corrosion resistance, good weldability, and high resistance to hot cracking.	The rods are particularly adapted for use where the deposit is to be heat-treated after welding to restore the original physical properties of the base metal.
Rust Preventive	Aluminum Serviron	An aluminum coating that is applied to dark surfaces which are damp, wet, or sweating. The coating formed is non-toxic and corrosion-resistant.	Used to coat water tanks, underground pipe lines, and hulls of ships.

For names and addresses of manufacturers of products listed, see end of this section.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Welding Flux and Wire	**Arcosite Flux and Chromar**	The particle size of the flux assures uniformity of arc action, alloy recovery, bead penetration and shape, and easy flow through flux-feeding devices. The wire is available in many compositions.	The flux is suitable for welding austenitic, ferritic, martensitic stainless steels. The wire may be used with many welding methods.
Metal-containing Resin	**Airtemp Plasti-Metal 707**	A two-component, epoxy-base resin which can be sawed, drilled, tapped, polished, and machined, and can be shaped into complex parts using both casting and laminating techniques.	Used to make jigs and fixtures, masters and models, foundry items, and plastic forming dies and molds.
Die-casting Alloys	**Aur-O-Met 56 Aur-O-Met 57**	These nickel-aluminum die-casting bronzes provide strength, corrosion-resistance, and ease of machinability. Both have a tensile strength of 120,000 pounds per square inch.	Use of these alloys in die-casting has resulted in the discontinuance of the use of steel forgings with bronze overlays and parts machined from solid bronze.
Floor Armor	**Baby Hexteel Surface Armor**	A lightweight hexagonal type floor armor which is usually filled with a hot or cold mastic.	For resurfacing ramps, factory aisles, runways, loading docks, and wherever rough usage prevails.
Resins	**Bakelite BR-18774 BR-18795**	These two Bakelite C-8 resins may be used with four hardeners to form strong, lightweight products. They cure to hard solids at low or room temperatures and can be combined with many types of inert fillers.	Dies for drawing metal, checking fixtures, frames, patterns, and tooling jigs have all been made from these resins.
Phenolic Resins	**Bakelite Phenolic Resins**	These resins have been used as a sand binder in making precision sand cores for aluminum castings. They help to provide the permanence of form needed to prevent distortion of precisely molded cores when removed from the core-box.	Cores produced using these resins withstand the pressure of molten aluminum at 1425 degrees F. long enough to accurately shape the interior of the casting.
Protective Coating	**Barcote No. 600**	A leaded-petroleum compound developed for the protection of metal surfaces against corrosion. It will flow at 0 degrees F., does not emulsify with water, has a strong affinity for metals, and is soluble in petroleum solvents.	Recommended for corrosion protection of structural steel and sheet metal, protection of rails and rail joints, lubrication of wire rope, and protection of parts in storage.
Beryllium-copper Alloy	**Beryldur**	A copper-base material of low beryllium content that combines the properties of the high-strength and the high-conductivity groups of beryllium-copper alloys in use today.	This material has potential applications in the field now occupied by phosphor-bronze and brass.
Structural Adhesives	**Bondmaster M615 Bondmaster M616**	Bondmaster M615 is intended for normal temperature use and exhibits a shear strength of up to 3500 pounds per square inch. Bondmaster M616 provides shear strengths up to 3000 pounds per square inch at a temperature of 180 degrees F.	For bonding metal-to-metal and metal-to-plastic. They were originally developed for aircraft structural applications but are now being used more widely.
Nickel-chromium-silicon Alloy	**Brinalloy**	High wear- and corrosion-resistance have been exhibited by this alloy. Its tensile strength exceeds 150,000 pounds per square inch.	Used as a seating material for bronze valves.
Solvent Degreaser	**Brulin Solvent Degreaser**	This highly concentrated solvent for degreasing and cleaning operations does not contain carbon tetrachloride or other toxic chlorinated solvents. It is nonflammable and does not require special clothing or ventilating equipment.	For use on production lines where speed is essential. It has been employed for cleaning electrical motors, having no adverse effects upon the electrical installation.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Stainless Steel	Carpenter Stainless No. 7-Mo (Type 329)	Resists nitric and hydrofluoric acids. This stainless steel is claimed to be the first metal to have commercial resistance to an extremely corrosive mixture of these strong acids.	For equipment where nitro-hydrofluoric acids are handled in pickling or similar operations.
Solder	Cen-Tri-Core	A rosin-coated solder wire covered with an outer solder sleeve. Its unique construction makes it possible to provide a solder wire with no flux voids and a means whereby flux can be made to flow ahead of the molten solder.	For general-purpose soldering. Despite its high activity, the rosin is non-corrosive and electrically non-conductive.
Soldering Flux	C-Flux	A greaseless and binderless flux used for joining copper tubing. The flux tins the metal as it cleans, permitting solder to flow smoothly with deep penetration.	Use eliminates the necessity of prior cleaning. It is also said to be advantageous because of easy cleaning of residues.
Leather Belt Preservative	Clarol	This preservative contains no oil, grease, or resin, and will not turn rancid. It "sets" in the leather to form a gelatinous structure that does not creep to the surface. Belts so treated repel water and steam.	Applied by brush, spray, or oil-can methods. It penetrates and acts as a lubricant for the fibers of leather belts.
Hard-facing Alloy	Colmonoy No. 2	A chromium-molybdenum-silicon alloy which can be deposited on manganese and other steels from an AC-DC welding electrode. After a second pass the deposit exhibits a hardness of 55 to 60 Rockwell C.	Applied to the working surfaces of construction, mining, and aggregate handling machinery where impact and wear resistance are required.
Core Material	Corfoam 114	A high-strength, light-weight material used for structural core applications. It exhibits a compressive strength of 37 pounds per square inch for a 3 pound per cubic foot density and 1100 pounds per square inch for a 21 pound per cubic foot density.	Used for making cores for stretch dies, jig dies, check fixtures, and models.
Degreasing Agent	Cottentex	A soft, finely ground cellulose fiber material with high absorbency for use in degreasing and drying operations that employ tumbling mills.	The agent is particularly adapted for greasing ball, roller, and needle bearings, and any other parts that can be processed in a tumbling mill.
Hard-facing Alloys	Crobalite	Three cobalt-chromium-tungsten hard-facing alloys in welding rod form. They are applied to steel and cast-iron parts to provide high hardness and good resistance to abrasion, corrosion, oxidation, and impact.	These alloys are applied by oxy-acetylene or arc welding, either manually or by semi-automatic machine, using standard hard-facing procedures.
Casting Alloys	DC-50	This hardenable corrosion-resistant alloy, having the same nominal composition as Armco 17-4 PH hardenable stainless steel alloy, is readily machinable in the solution-annealed condition, and when hardened has appreciable ductility and toughness.	Recommended for applications where wearing conditions exist, such as ship propellers and pump impellers; also used as a casting material for structural parts of aircraft and for thrust bearings.
Dry-film Coatings	'dag' Dispersion Nos. 213 and 223	These two products—the first of which contains colloidal graphite and the second, colloidal molybdenum disulphide—give films that adhere well and are wear-resistant. They are unaffected by oils and solvents and can be used at temperatures up to 500 degrees F.	Typical uses for these products include dry lubricating films for high-temperature screw threads, precision gears, bearings, and shafts.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Anti-seize Sealant	'dag' Dispersion No. 217	A graphite product that prevents seizing and provides sealing. It is non-flammable even in the presence of high-pressure oxygen at temperatures of 575 degrees F. and higher.	It has been used as an anti-seize and sealant for high-pressure oxygen systems where line pressures reach 2000 pounds per square inch.
Cutting Oil	Dasco	A soluble base oil that exhibits stability and resistance to rancidity and is used to make lean mixtures of oil and water for metal-cutting and grinding.	Mixtures consisting of forty parts of water to one of the oil are used for milling, drilling, turning, etc. Grinding mixtures are prepared in a ratio of 100 to 1.
"Plastic-Metal"	Devcon	A product composed of a combination of fine steel powder and a hardenable plastic. It becomes a strong, tough, and rigid metallic piece approximately two hours after forming. It does not shrink or distort, is resistant to many solvents, oils, and acids, and is capable of being plated with chromium, nickel, or copper by conventional methods.	It is as easy to form as modeling clay and is used for making durable and permanent drill fixtures and jigs, forming and drawing dies, and holding devices.
Strippable Coating	Dip-Pak No. 661	This hot-melt, strippable coating exhibits no oil exudation and will remain flexible up to temperatures of 160 degrees F., is transparent, clear, and resistant to darkening under heat.	It functions as a semi-permanent coating for metal objects, as a strippable coating for metal, as an insulating and potting compound, and as a plating stop-off.
Magnesium Sheet and Extrusions	Dow Magnesium Sheet and Extrusions	Magnesium in the form of rolled plate and in special extruded shapes. Dimensional stability during and after machining has been insured by stress-relieving above 700 degrees F. It is tough and free from porosity.	For making checking fixtures, bases, and gages; assembly and locating jigs, fixtures, and bases; and vibration test fixtures.
Aluminum "Metal" Coating	Duro Aluminum Shell Coating	An anti-rust shell of non-porous aluminum "metal." It will withstand considerable flexing, as well as extreme hot and cold temperatures and can be filed.	In addition to protecting structural work, it is useful for coating porous castings, metal signs, and automobile bodies, as well as wood.
Spring Alloy	Elgiloy	A cobalt-base spring alloy noted for its high hardness, toughness, tensile strength, and corrosion and fatigue resistance.	Available as raw stock and in heat-treated and fabricated form. It is commonly used as a spring material in watches and electrical appliances.
Water-reducible Paint	Emulsion Type Enamel	This paint is an emulsion type enamel in which water is employed both as an ingredient and a reducing agent. It is not water soluble after application. Its glossy finish, which is very hard, has high impact and oil resistance.	May be applied by brushing or spraying. After application, the enamel can be machined or fabricated without damage to either the finish or the cutting tools.
Rustproofing Material	Endurion	A chemical immersion method of treating work-pieces made from ferrous metals. Products treated will withstand salt spray for long periods of time.	A coating that can be applied in colors ranging from gray and black through blue, green, and olive drab.
Stripper	Enthone Compound L-88	A ready-to-use liquid which, when used in conjunction with a 6-volt source, strips defective copper, nickel, and chromium plates from zinc base die-castings.	For stripping zinc base die-castings. Refinishing of the die-casting is accomplished by a light buffing operation.
Welding Rod	EutecRod 115	Exhibits low bonding heat, quick tinning action, long working range, and easy spreading properties.	Used primarily for sealing cracks and building up worn and poorly machined surfaces of cast iron.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Die Steels	FM	Select B, GSN, Cobalt Chrome, and BR-4, types of steel that possess the "free-machining" properties of Olympic FM air-hardening die steel.	For numerous die steel applications. The improvement in the machinability of these steels has no effect on their other physical properties, nor do they require any change in the normal heat-treatment.
Vacuum-melted Alloys	Ferrovac-52100	The vacuum melting of steel as well as high-purity nickel, copper, iron, and alloys of these metals facilitates the precise control of very dilute alloying additions and impurity traces in producing these alloys.	Used for making bearing balls and electronic tube components.
Surface Coating	Ferrox	A non-skid plastic abrasive composition which resists the action of oil, chemicals, and weather.	Suitable for application to concrete floors, ramps, platforms, and around machine areas.
Sintered Carbide	Firthite TXL	A sintered carbide with a hardness of 92 Rockwell A, high strength, and good wear and shock resistance.	For steel-milling applications.
Tubing	Flexon	A thin-wall stainless-steel tubing available in standard and high-strength classifications for industrial uses where corrosion resistance, light weight, and special shapes or bends may be required.	Fittings and component parts made from this tubing can be attached to either straight or flexible tubing by resistance circumferential seam-welding.
Rustproof Coating	Gard Anti-Rust Spray	A rustproof coating containing silicones and polar compounds. The film formed is non-creeping and self-healing. It displaces water and neutralizes fingerprints on gages or tools.	Formulated to prevent rust and corrosion in both outdoor and indoor storage of fine equipment.
Lubricating Process	Gorlube	A process that incorporates a solid film lubricant of molybdenum disulphide into the working surfaces of rubber parts to reduce their frictional qualities.	For the treatment of O-rings, valve seats, rubber packings, resilient mounting, and similar parts.
Cemented Carbides	Grade CA-608 Grade CA-610	These alloys resist the cratering action of the continuous chip and are provided with great impact resistance. CA-608 is recommended for light machining and finishing. CA-610 is designed for use where breakage is the factor limiting tool life.	For machining steels of high alloy content or other hard materials. CA-610 may be used for cuts that are interrupted and CA-608 where increased speeds and decreased feeds may be required.
Aluminum Alloy	HZM 100	An extruded alloy with good corrosion-resistant properties, especially at high stress concentration areas.	For aircraft structural use where light weight, strength, and resistance to corrosion are important factors.
Resin-impregnated Wood	Hasko-Preg	A laminated wood product which exhibits good dimensional stability. It is affected very little by temperature and humidity changes. The material is decay-, acid-, and heat-resistant.	For making die models and patterns, housings for electrical control equipment, and acid-bath tanks.
Drill Blanks	Hayden Drill Blanks	These blanks are available in six tolerance ranges other than the regular unground condition.	These blanks are used to make gages, test bars, dowels, etc.
Tungsten Alloy	Hevimet	A high-density, high-tensile strength alloy of tungsten, nickel, and copper that can be readily machined and ground. Its machining characteristics are similar to those of cast iron.	It is used extensively for radioactive shielding and because of its weight, as a material for balancing.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Glazing Material	**Homalite CR-39**	A transparent scratch- and abrasion-resistant glazing material which can be easily machined and is virtually unaffected by welding splatter. The material is light-weight and highly resistant to shatter.	It is used for such safety applications as goggles and shields, instrument faces, grinding wheel guards, and windows for viewing dangerous processes.
Plastic Sealant	**Imprex**	This plastic sealant is used to permanently seal excessive "leaker" and even "squirter" pressure castings. After impregnation and hardening, a solid non-brittle bond with the pressure casting is formed.	This sealant does not require any special handling or storage, and before hardening may easily be washed off with water.
Welding Electrode	**Inco-Rod "A"**	A multiple-purpose welding electrode that yields strong, ductile joints between a large number of metals having substantially different compositions.	Used in the joining of ferritic materials, such as mild or stainless steels.
Leaded Steels	**J & L 1213 J & L Type "A" and J & L 1113 Leaded Steels**	These steels posses a free-cutting property that facilitates the making of a smooth-finish machined surface. The lead acts as a lubricant on the cutting edge of the tool and the steel breaks up into small chips as it is being cut.	Used in the screw machine industry for small machine parts such as hydraulic fittings, parts for automobiles, household appliances, etc.
Steel Alloy	**Jalloy Grade 3**	A general-purpose steel capable of heat-treatment which offers good resistance to abrasion or wear. This steel is available with a minimum of 0.20 per cent copper for improved resistance to atmospheric corrosion.	This alloy is being used for mine, farm and earth-moving equipment, and wherever abrasion- or wear-resistance is a requisite.
Sintered Carbide	**K21**	A multi-purpose sintered carbide steel-cutting material, designed for high productivity on both high- and low-speed machines. The material has a hardness of 91.5 on the Rockwell A scale. It has high edge strength, combined with good wear qualities.	Designed for numerous machining operations. Its resistance to cratering makes its use in plunge and interrupted cutting of castings having sand inclusions and hard spots particularly effective.
Alluminum Alloy	**K186**	A high-strength aluminum alloy, with tensile strengths ranging from 38,000 to 47,000 pounds per square inch. It exhibits good forming characteristics and is corrosion-resistant.	Available in sheet and plate form, in a range of four tempers, for such uses as fabricating unfired pressures vessels, structural towers, trusses and girders, and scaffolding.
Photographic Paper	**Kodagraph Contact Paper Translucent**	This paper, which will withstand considerable handling and use, is intended to promote faster print-back speeds when diazo or blueprint reproductions are to be made.	Use of this paper provides an advantage in that lines can easily be removed by a slight moistening followed by erasure with an ordinary pencil eraser.
Aluminum Metalizer	**Kolmetal**	Metallizing of surfaces with aluminum is possible by using this material. The finished surface can be polished, ground, drilled, or bent to a 45-degree angle without chipping or cracking.	It is used for food processing equipment, structural iron and steel, and ducts and piping. It exhibits resistance to corrosion and retains its finish and adhesiveness over a wide range of temperatures.
Plastic Tooling Material	**L-930 Surface Casting Resin (Metallic)**	A plastic tooling material, consisting of a metal filler containing a hardener and a resin, which has a metallic appearance and a low viscosity. It has a two- to four-hour hardening time at room temperature. It bonds well with metals and is non-corrosive.	For resurfacing metal dies, leveling die bases to eliminate machining, and making form-blocks, foundry patterns, and core-boxes. It can also be used for jig locator pads and hydraulic press wedge blocks.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Fiberglass	Lamicor	This industrial tooling material has a tensile strength of 27,700 pounds per square inch, and a compressive strength of 35,200 pounds per square inch. It can easily be fabricated into special shapes, is fire-resistant, and is easily cleaned.	For making fixtures, templates, and jigs of all kinds.
Protective Coating	Laqua	Preserves both electroplated and chemically cleaned surfaces. Prevents discoloration caused by oxidation, contact with sulphur fumes, humidity, salt spray and fingerprints.	Suitable for use in the metal products, sheet metal, and automotive industries for preserving newly cleaned metal surfaces.
Industrial Adhesive	Liquid Adhesive	This liquid adhesive will permanently fasten rubber, metals, wood, plastics, ceramics, or fibers together in any combination. It takes only fingertip pressure to join the materials together.	The cement has already been adopted for use in building machinery, radar, electronic equipment, etc.
Aluminum Alloys	Lurium L, L5, L10, and L20	These high-purity aluminum alloys have a luster that is durable and non-tarnishing (produced as a result of polishing) and are easily worked using standard fabricating techniques.	For use where high-purity aluminum is required and for applications where a reflectivity of 83 per cent of a silvered mirror may be desired.
Plastic-metal Laminate	Marvibond	A vinyl-to-metal laminated material that combines the corrosion resistance of vinyl plastic with the formability of aluminum or steel. It can be deep-drawn, sheared, crimped, bent, embossed, etc., without damage to the coating or the bond.	For fabricating industrial and commercial equipment and parts. Users may employ automatic feeds and progressive dies that are common to regular metal coil fabrication.
Aluminum Compound	Metalset (A 101)	This epoxy-resin aluminum compound adheres strongly to metal, particularly aluminum and many other surfaces. It is hard, tough, and machinable down to a feather edge and has good mechanical stability.	For repairing castings, filling joints in sheet metal, and building up surfaces of patterns, molds, and dies. It can be applied in any thickness without cracking and with negligible shinkage.
Penetrant Dye	Met-L-Chek Flaw Finder	A water washable dye that penetrates ordinary seals for the detection of defects or flaws in metal, glass, and most plastic surfaces.	For testing parts on conveyor belts in production line set-ups and for maintenance purpose such as checking gears, shafting, and castings for fatigue cracks.
Strip Material	Microstrip	A close-tolerance grade of beryllium copper strip available in thicknesses from 0.001 to 0.032 inch with minimum tolerances ranging from plus and minus 0.0001 inch to plus and minus 0.0004 inch, depending upon thickness.	For general-purpose applications where close-tolerance beryllium copper is needed. Uniformity of hardness, formability, microstructure, and aging response are assured because of the solution annealing it undergoes during manufacture.
Lubricant	Molykote 165X	Gear lubricant for highly loaded gears which can only be lubricated infrequently. The film, containing molybdenum disulphide, will not crack or peel off at temperatures as low as 0 degrees F.	For construction machinery, elevator and escalator gear trains, and mechanical presses and power shears.
Welding Electrode	Murex Croloy	Use of these electrodes reduces the need for preheating and heat-tratment subsequent to welding. The weld deposits of these electrodes exhibit good stress-rupture characteristics over a wide range of temperatures.	For use where chromium-molybdenum steels are welded in the production of equipment for high-temperature and high-pressure service.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Pulley-lagging Material	Neolag	The lagging, which can be performed in place without removing the pulley from the shaft, entails the use of a primer, a cold bonding agent, and Neolag.	This Neoprene sheet material is used for lagging pulley surfaces.
"Baked" Protective Coating	Nerva-Kote Tae	Resists alkalies, acids, and solvents, adheres to all surfaces, and has good flexibility and long life. It exhibits weather, impact, and abrasion resistance.	For the protection of duct surfaces, machinery, vessels, walls, tanks, etc. The coating produced is similar to one that is baked.
Nickel-clad Strip	Nickel-Clad Steel Strip	This thin-gage strip can be produced in thicknesses down to 0.003 inch to tolerances as close as plus and minus 0.0001 inch, and in widths down to 0.093 inch.	For making lead-in wires for electronic tubes and grid support rods where a surface of pure nickel is necessary.
Thin-gage Strip	Nickel-Silver Strip	This malleable and ductile metal is tough and highly resistant to corrosion, wear, and fatigue. It is custom rolled up to 6 inches in width and down to 0.0005 inch in thickness to tolerances as close as plus and minus 0.0001 inch.	Typical uses for this 18 per cent nickel-silver strip include diaphragms, radio and telephone springs, and other stamped, drawn, or spun articles.
Aluminum Alloy	66S	A strong, lightweight aluminum alloy which is economical to use, since thinner sections may be employed in the making of structural elements.	Applications include structural members in buildings, large motor vehicles, and aircraft.
Aluminum Alloy	5083	A non-heat-treatable alloy which can be welded rapidly (with no preheating) by using the inert-gas arc-weld method.	Used in aluminum fabrication and welding of such items as ships, trucks, and railroad cars.
Adhesive Tape	No. 131 Behr-cat Flatback Tape	This high-strength, high-adhesive paper tape can support a weight of at least 45 pounds without breaking, can withstand temperatures up to 250 degrees F., and leaves no deposits upon removal.	For holding protective coverings in place during equipment manufacture and for packaging machine tools and other equipment for storage.
Sealing Compound	No. 576.1 Permagum	A white mastic sealer that is non-staining, non-hardening and odorless. The sealer is extruded in handy beads, tapes, and ribbons that can easily be thumbed into slots, holes, crevices, and cracks to seal against water, vapor, dust, or air.	This compound has been found to be particularly useful in the automotive, refrigeration, and air-conditioning industries.
Aluminum Etchant	Oakite Composition No. 160	This material is readily soluble in water to form working solutions having a long life. Hot or cold water can be used in rinsing. No troublesome fumes are given off.	Provides a rapid, uniform controlled etch on aluminum, and eliminates the troublesome problem of hard sludge build-up on equipment surfaces.
Electrocleaning Material	Oakite Composition No. 191	An electrocleaning material which reduces the tarnishing of copper and its alloys in the high-temperature cleaning ranges. Advantages claimed for the material are a long solution life, and broad current-density and temperature ranges.	Used to reduce the tarnishing of copper and its alloys. It cleans at low concentrations, removes buffing dirt and other common soils rapidly, and is rinsable in water.
Cleaning Compound	Oakite Compound No. 131	The compound is a non-viscous, amber-colored liquid that is soluble in water or alcohol in all proportions.	For the removal of rust, heat-scale, tarnish, and other oxides from ferrous metal parts.
Coating Material	Oakite Crys-Coat SW	A zinc phosphate coating material for iron and steel designed for use in pressure-spray washing machines. It is fine-grained, dense, and relatively non-porous.	For coating iron and steel parts to protect them from the effects of corrosion.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Liquid Pickle Control	Oakite Pickle Control No. 5	A liquid inhibitor for sulphuric, hydrochloric or phosphoric acid, or mixtures thereof which also provides a controlled foam blanket on pickling solutions. It is a viscous red-brown liquid with a characteristic odor.	Designed for use in continuous steel-strip mills, where the addition of an inhibitor through proportioning equipment is preferred, and in batch pickling operations, because of the ease of making additions.
Derusting Compound	Oakite Rustripper	An alkaline derusting and descaling powder that may be used in hot or cold solutions, and may also be used with direct current to remove deep-pitted rust, or with reverse current to remove heat scale. It does not cause hydrogen embrittlement or create troublesome fumes.	For derusting precision parts where dimensional change and acid embrittlement must be avoided. Also used for descaling heat-treated titanium in aircraft plants.
Stripper	Octastrip 31	This paint and varnish stripper is nonflammable, is used with cold water and can be rinsed.	Applications include the stripping of almost all organic coatings from various parts.
Die Steel	Olympic FM	A free-machining, high-carbon, high-chromium die steel of the D-2 cold-work die steel type. It may be machined at speeds and feeds in excess of those normally possible with standard D-2 steels.	Use of this material will produce machined surfaces that require a minimum of finish-grinding.
Die Steel	Ottawa 60	A high-carbon, high-vanadium die steel with good wear resistance which is produced in bars and forgings. This steel may be forged, annealed, hardened and tempered. It does not machine so well as high-carbon, high-chromium tool steels.	Designed for making dies for deep-drawing and forming of stainless steel without galling or pick-up.
Strippable Coating	PV-845	Aluminum-pigmented strippable coating which requires no surface preparation and can be stripped easily without leaving a greasy residue. Applied by either brush or spray methods.	Used on all types of metals during both inside and short-term outside storage. For polished surfaces to prevent marring and scratching.
Strippable Film	Peel Filmite	A paint spray-booth protective coating which, when used in regular spraying equipment, provides a fireproof, peelable film. The film resists the action of alkalies, acids, oils, and many other chemicals.	It is applied to the walls of a paint spray-booth. When paint overspray accumulates, the paint-laden coating can be peeled off in big sheets.
Beryllium Copper Strip	Penntemp	A mill-hardened or pretempered beryllium copper, which offers the features of regular age-hardening beryllium copper yet requires no heat-treatment. It offers high-strength, hardness, good fatigue resistance, conductivity, and corrosion resistance.	Available in five tempers in thicknesses from 0.001 to 0.025 inch and in widths from 1/8 inch to 5 inches for various applications.
Tooling Compound	Plastik-Tul	A viscous, metal-filled plastic material, which can be molded like putty or poured into a form. It can be drilled, tapped, threaded, milled, broached, sawed, painted or plated and is unaffected by cutting oils, solvents, and greases.	For making jigs, fixtures, plugs, gages, forming dies, holding fixtures, and masking fixtures.
Protective Coating	Porcenell	A silicate or glass-like protective coating material which is fused to any clean ferrous metal surface at temperatures ranging from 900 to 1200 degrees F. The coatings are claimed to be fireproof, scratch resistant, and to have a permanence of color.	Applied by spray, brush, or dipping methods, and then fired, these materials are used to coat the surfaces of sheet and plate steel; cast, wrought, and malleable iron; and high-carbon steels.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Silver-alloy Sheets	**Porous Silver Alloy**	A porous silver material, which may be impregnated easily with various lubricants. It is capable of carrying bearing loads of 50 to 75 per cent of those carried by solid silver bearings.	For use as a bearing liner material.
Protective Coating	**Proseal No. 16**	A chromate conversion protective coating which inhibits corrosive action between paint and aluminum.	Designed for any application where extruded, forged, wrought, or cast aluminum and its alloys are used.
Penetrant	**Puritan Penetrant**	An odorless chemical formulation applied by pour spout or squirt gun. Several minutes after application the work can be struck lightly with a hammer and the parts disassembled by using the proper tools.	For loosening corroded nuts or bolts or larger seized parts of mechanical equipment.
Titanium Fasteners	**RC 130B Wire Fasteners**	These fasteners exhibit a minimum tensile strength of 150,000 pounds per square inch and a minimum shear strength of 95,000 pounds per square inch.	The weight-saving possibilities of these fasteners are of particular interest to builders of airframes and engines.
Brazing Alloy	**RSNI**	This alloy does not flatten out at the brazing temperature to form thin fillet edges. However, because of this sluggishness, particular care is required to flow the material into the joint.	For use in overcoming crevice corrosion problems prevalent in brazing the 400 series straight chromium stainless steels.
Titanium Alloy	**Rem-Cru A-110AT**	A single-phase all-alpha grade titanium-base alloy that contains 5 per cent aluminum and 2 1/2 per cent tin. It exhibits good welding and hot-working characteristics, and provides elevated temperature strength.	Recommended for all titanium parts requiring maximum strength in the temperature range of 700 to 1100 degrees F.
Copper Dipping Process	**Rossaul Copper-Brite**	Removes atmospheric oxides and simultaneously passivates metal to resist oxidation for periods from three to six months. Materials used are non-toxic, non-fuming, and will not etch or discolor silver solder.	For the brightening and passivation of copper and most copper alloys.
Casehardening Compound	**Royal Hardening Powder**	This casehardening compound developed to replace cyanide and thereby eliminate poisonous fumes provides a case depth of 0.01 to 0.02 inch.	Provides a simple method for the quick surface-hardening of steel tools, dies, parts, and cutting implements.
Corrosion-resistant Paint	**Rubalt "RA"**	This paint is non-porous and flexible and has good adhesive properties. It resists the action of many acids and alkalies and requires no primer or pre-treatment.	This black corrosion-resistant paint which looks like patent leather and has a rubbery feel is used to coat many varied metal surfaces.
Stripper	**Rustgon**	This stripper contains no cyanide compounds, requires no electrolytic action, and gives off no corrosive fumes. Parts to be treated are dipped into a tank, then withdrawn and rinsed with air and water or with steam.	This non-acid material strips paint, rust, and primer from ferrous metal surfaces.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Lead-bearing Steels	Rycut 20 and 40	Rycut 20 is a low-carbon carburizing grade of lead-bearing AISI 8620 steel which has good machinability and may be heat-treated in a manner similar to the standard AISI 8620. Rycut 40 is standard AISI 4140 alloy. Addition of lead does not change the heat-treating characteristics or the hardenability.	For applications which require steels that will machine up to 50 per cent faster than standard medium-carbon alloy steels. Mechanical properties of both the leaded and non-leaded steels after heat-treating are said to be identical.
Laminated Sheeting	Scotchply Reinforced Plastic	A high-strength, corrosion-resistant, uniform-quality, glass-in-plastic laminated sheeting that is moldable by using ordinary methods. It can be sawed, sheared, punched, drilled, sanded, painted, etc.	Adaptable for the matched metal or plastic die method of molding as well as other commonly known molding techniques in use today.
Rust-preventive Oil	Siliconized Witch Oil	A rust preventive that can be applied over a black oxide, phosphate, or other type of finish to impart good corrosion resistance.	Exhibiting water and moisture repellancy and lubrication qualities, it is used for protecting work in process and finished parts in storage.
Metal Cleaner	Solo-Phos	This cleaner reacts with organic or metallic soils and provides an ideal base for paint. It will not attack rubber-tired wheels or painted and plated surfaces. Flash point is above 200 degrees F.	Applied in concentrated form by spraying, flushing, or dipping. It gives a rust-inhibitive phosphate coating to ferrous metals, aluminum, and zinc.
Metal Powder	Stain-Alloy	This stainless-steel powder is resistant to intergranular corrosion of the sintered compact. It is a bright, free-flowing powder, all particles of which pass through a 150-mesh screen, and approximately 60 per cent of which will pass through a 325-mesh screen.	Used by fabricators of gears, self-lubricated bearings, welding alloys, bushings, and small precision mechanical parts, as well as for conventional sintered parts.
Steel Bars	Stressproof Steel Bars	These bars can easily be machined and have the strength and wearability of practically any alloy or heat-treated carbon steel bar.	For plant maintenance departments. Round and hexagonal bars are available which will handle practically any repair job.
Polystyrene Plastic	Styron 480	Parts made from this high impact resistant plastic may be molded around metal inserts and can also be stapled. It can readily be extruded into shapes or sheet, as well as fabricated on standard injection molding machines.	Applications include the making of such items as action toys, refrigerator pans, and portable radio cabinets.
Floor Coating	Sure Grip	An abrasive-filled plastic coating for floors, which is brushed on like paint. It dries within ten hours after application and resists the action of gasoline, oil, alcohol, and water.	Employed to eliminate spills and falls that result in injuries and time losses. It may be applied to wood, metal, or concrete surfaces and is available in two colors, red or gray.
Paste Solder	SweTite Paste Solder	A half-and-half blend of powdered solder and an active flux which requires no prior cleaning for most applications. Joints obtained are as strong as those made by conventional methods.	For sweat soldering or tinning. Paste is applied with a brush or a cloth, the parts are fitted together and heat is applied.
Sealer	Tamper Proof Sealer EC-1252	This fast-drying sealer is applied over adjustable or removable parts to indicate changes in adjustment or other evidence of tampering by a break in the seal when a part is altered in position.	Access doors or removable panels on gages, and electronic or recording instruments are examples of industrial equipment that can be sealed off.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Cutting Oil Solvent	Tecsolv No. 427	This solvent is non-flammable, is approximately one-tenth as toxic as carbon tetrachloride and has approximately the same evaporation rate.	Used to replace carbon tetrachloride in cutting oils.
Bearing Lubricant	Texaco All Temp	This grease exhibits good shear stability, high oxide resistance, and the capacity to perform even when contaminated with water.	Used as a bearing lubricant over a wide temperature range, eliminating the necessity of storing and applying a large variety of greases.
Drawing Compound	Texaco Drawing Compound No. 3	This drawing compound which is water-miscible in ratios ranging from equal parts to 1 to 15 parts is a mixture of mineral oil, emulsifying agents, non-abrasive pigment, and a dispersion additive which insures against its caking on dies and knock-out or stripper mechanisms.	For handling work being processed under difficult forming conditions. It prevents metal-to-metal contact which virtually eliminates die galling, sticking, and seizure. The compound is easily removed by washing with water.
Thread Compound	Thred-Gard	The compound eliminates seizing and galling at operating temperatures up to 1200 degrees F. It is non-hardening and acts as a lubricant to allow an easy disassembly of threaded connections even after long or severe service.	Protects against the welding action of threaded connections subjected to prolonged exposure at high temperatures, thus permitting the re-use of studs, bolts, pipe joints, etc.
Iron Alloy	Tisco 150-Y	An extremely hard, abrasion resistant iron alloy capable of being heat-treated to 700 Brinell.	Applications include the fabrication of equipment used for handling abrasive materials.
Cutting Material	Titanium Carbide	This new carbide cutting material contains no tungsten or cobalt but uses nickel as a binder and molybdenum carbide as an alloy carbide addition. It has high wear-resistance characteristics.	The life of tools made from this material is long when used for steady finishing cuts, particularly when high speeds and fine feeds are employed in machining hard abrasive steels.
Lock-nuts	Titanium Lock-Nuts	Each of these lock-nuts weighs less than half of a similar steel nut yet meets the same tensile strength specifications.	These nuts are available as 12-point (double hexagon) nuts with nylon locking inserts in a diameter size range of 5/16 to 5/8 inch.
Thin-gage Strip and Foil	Titanium Strip and Foil	Commercially pure titanium precision-rolled to very close tolerances in thin-gage strips and foil that possess good corrosion resistance and ability to withstand high temperatures.	Available in sizes as wide as 8 inches down to a thickness of 0.0005 inch within tolerances as close as plus and minus 0.0001 inch, for such typical uses as cowlings, ducts, and fire walls.
Laminating Resins	Toolplastik L-900 and Toolplastik Gelkote L-910	These non-shrink, non-laminating resins are neither corrosive nor brittle, and are easy to apply and cure at room temperatures. Special facilities and equipment are not required.	For use with glass-cloth reinforcing in such tooling applications as the fabrication of jigs and fixtures, models, and prototypes.
Degreasing Solvent	Triclene D	A trichlorethylene vapor degreasing solvent developed to resist all the major causes of solvent breakdown. It resists the effects of light-metal chlorides, light, air, heat, and acids. It contains no elements that tend to harm or stain the work it cleans.	Used in small vapor units as well as multiple-compartment conveyorized degreasers. Tank truck quantities are available to users capable of storing large amounts in their plants.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Hard-surfacing	Tungstide	A "metal-cladding" that imparts to a surface a hardness and an abrasion resistance almost equal to metallic tungsten, and is self-lubricating as well. It consists of metallic tungsten particles suspended in a liquid plastic into which is incorporated a hardening form of molybdenum disulphide.	Applicable by brush, dip, or spray methods. It may be used for reducing wear on plastic drilling, assembly, and checking jigs, and for replacing the metal inserts formerly used to cover wear spots on plastic molds and tools.
Aluminum Welding Flux	Type 202	Reduces oxides immediately upon application and becomes liquid when the metal is ready to weld, thus allowing operator to see exactly what he is doing while welding. Easy removal after welding; no corrosive pitting of parent metal.	Enables user to employ oxy-acetylene welding and serves as a back-up material on butt or T-joints to control penetration, can also be used to eliminate the oxide notch on back of the work.
Rust-preventive Coatings	Ucon	A series of rust-preventive fluids that can be burned cleanly from metal surfaces after storage. They do not leave residues after burning that interfere with painting, welding, soldering, brazing, or annealing.	For coating metal parts before storage to prevent their rusting.
Stainless-steel Tubing	Unionweld	A stainless-steel welded tubing which does not require annealing after fabrication. The weld produced by the gas shielded-arc process is sound, ductile, and corrosion-resistant.	Produced in a size range of from 1/4 inch to 5 inches outside diameter with wall thicknesses of from 0.010 to 0.154 inch.
Thread-grinding Compound	Vantrol 5299M	This compound provides adequate lubrication in a process that requires heavy stock removal with a small area of wheel contact where the resulting pressure generates excessive heat.	Its use in thread-grinding applications reduces the rate of wheel wear, prevents uneven wheel wear, and permits a shallow cut to be taken when dressing the wheel.
Cleaning Compound	Vantrol 5541	An alkali compound that will not etch or discolor aluminum but will thoroughly spray-wash heavy soils from it. It is non-toxic and non-flammable.	Used mainly for aluminum but also for zinc, brass, copper, bronze, and ferrous metals.
Marking Materials	Vaporite Industrial White Ink and Jiffy-Rite Fountain Pen	A white ink and accompanying fountain pen that can make white markings on dark, flexible, and highly polished surfaces, which will neither flake nor rub off and are resistant to cutting oils and coolants. Solvents furnished with the materials remove the ink easily when desired.	For circling defective holes and rivets, marking parts for production-line assembly, code marking, and masking of templates before flushing with cutting oils.
Steel Powder	Vasco 4650-A	A pre-alloyed nickel-molybdenum steel powder that has good green strength and is readily moldable at low pressures to yield dense, strong compacts.	For powder metallurgical applications. Parts can easily be heat-treated and as a result of this heat-treatment possess a toughness comparable to that of alloy steel.
Hard-Facing Alloy	Walloy No. 6	A chromium-cobalt-tungsten hard-facing alloy available in welding-rod form which has high impact strength, and corrosion and abrasion resistance. It is said to resist chipping and spalling and to have some ductility.	Edger rolls and swaging mandrels, engine exhaust valves and seats, dies, etc. may be suitably hard-faced with this alloy.
Nickel Alloy	Waspaloy	A nickel-based heat-resisting alloy that has high heat-resisting properties, permitting jet engines to operate for long periods of time.	For jet-engine turbine blades.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Aluminum Forging Alloy	X7079	Exhibits uniformity of properties in heavy sections and good ductility in cross-grained directions. Forgings up to 7 inches in thickness and heat-treated in full section exhibit a tensile strength of 73,000 pounds per square inch in the longitudinal direction.	This material is used for making forgings for the aircraft industry. It is highly resistant to stress corrosion cracking and is not susceptible to distortion during machining.
Industrial Paint	ZRC	A paint containing 93 to 95 per cent metallic zinc, which prevents the corrosion of iron and steel surfaces, employing the principle of anodic protection.	Applied by brush or spray techniques, it dries to the touch within thirty minutes and is completely hard in four hours. For maintenance protection of structures and equipment.
Chromium-iron Alloy	ZeVeSeal	A work-hardening chromium-iron alloy exhibiting a good wear life under extremely abrasive conditions. It can be work hardened to hardnesses in excess of 700 Brinell on the wear surfaces.	It has sufficient toughness to make it suitable for paddles, sand impellers, and conveyor rolls in gravel mixers and similar machines where wear resistance is a prime requisite.

Names and Addresses of Manufacturers of Products Listed

A54S—Aluminum Co. of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.

AR493—General Electric Co., Pittsfield, Mass.

Acrawax C Atomized—Glyco Products Co., Inc., Empire State Bldg., New York 1, N. Y.

Adelphi One Coat Counter-Rust—Adelphi Paint & Color Works, Inc., 86-00 Dumont Ave., Ozone Park 17, N. Y.

Aircosil Alloys and Flux—Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.

Alk-A-Sol—Whitfield Chemical Co., Dept. 15-B, 14225 Schaefer Highway, Detroit 27, Mich.

All-State Metal-Filler; All-State No. 356—All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N. Y.

Aluminum Serviron—Xzit Chemical Co., 158-14th, Hoboken, N. J.

Arcosite Flux and Chromar—Arcos Corpn., 1500 S. 50th St., Philadelphia 43, Pa.

Aritemp Plasti-Metal 707—Aries Laboratories, Inc., 270 Park Ave., New York 17, N. Y.

Aur-O-Met 56 and 57—Aurora Metal Co., Aurora, Ill.

Baby Hexteel Surface Armor—Klemp Metal Grating Corpn., 6603 S. Melvina Ave., Chicago 38, Ill.

Bakelite Phenolic Resins; BR-18774 and BR-18795—Bakelite Co., a Division of Union Carbide and Carbon Corpn., 260 Madison Ave., New York 16, N. Y.

Barcote No. 600—Brooks Oil Co., 934 Ridge Ave., Pittsburgh 12, Pa.

Beryldur—Beryllium Corpn., Reading, Pa.

Bondmaster M615 and M616—Rubber & Asbestos Corpn., 225 Belleville Ave., Bloomfield, N. J.

Brinalloy—Lunkenheimer Co., Beekman, Waverly and Tremont, Cincinnati, Ohio

Brulin Solvent Degreaser—Brulin & Co., Inc., Dept. 295, 2939 Columbia Ave., Indianapolis 7, Ind.

Carpenter Stainless No. 7-Mo (Type 329)—Carpenter Steel Co., Reading, Pa.

Cen-Tri-Core—Alpha Metals, Inc., 56 Water St., Jersey City 4, N. J.

C-Flux—American Solder & Flux Co., 19th and Willard Sts., Philadelphia 40, Pa.

Clarol—Viscol Co., 18 East Ave., Bridgeport, Conn.

Colmonoy No. 2—Wall Colmonoy Corpn., 19345 John R St., Detroit 3, Mich.

Corfoam 114—Rezolin, Inc., 5736 W. 96th St., Los Angeles, Calif.

Cottentex—Cottentex Mfg. Co., 405Q E. Wells St., Milwaukee, Wis.

Crobalite—Crobalt, Inc., 2800 S. State St., Ann Arbor, Mich.

'dag' Dispersion Nos. 213, 217, and 223—Acheson Colloids Co., Port Huron, Mich.

Dasco—D. A. Stuart Oil Co., Ltd., 2727 S. Troy St., Chicago 23, Ill.

DC-50—Donegal Mfg. Co., Marietta, Pa.

Devcon — Chemical Development Corpn., Danvers, Mass.

Dip-Pak No. 661—Fidelity Chemical Products Corpn., 470-474 Frelinghuysen Ave., Newark, N. J.

Dow Magnesium Sheet and Extrusions—Dow Chemical Co., Midland, Mich.

Names and Addresses of Manufacturers of Products Listed

Duro Aluminum Shell Coating—Industrial Division of the Woodhill Chemical Co., 1391 E. 33rd St., Cleveland 14, Ohio.

Elgiloy—Elgin National Watch Co., Elgin, Ill.

Emulsion Type Enamel—Sherwin-Williams Co., General Industrial Division, Cleveland 1, Ohio

Endurion—Rust-Proofing & Metal Finishing Corpn., Cambridge, Mass.

Enthone Compound L-88—Enthone, Inc., Dept. M, 442 Elm St., New Haven, Conn.

EutecRod 115—Eutectic Welding Alloys Corpn., 40-40 172nd St., Flushing, N. Y.

Ferrovac-52100 — Vacuum Metals Corpn., 70 Memorial Drive, Cambridge 42, Mass.

Ferrox—American Abrasive Metals Co., Irvington, N. J.

Firthite TXL—Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Flexon—Flexonics Corpn., 1368 S. Third Ave., Maywood, Ill.

FM—Latrobe Steel Co., Latrobe, Pa.

Gard Anti-Rust Spray—Gard Industries, Inc., 733 Green Bay Road, Wilmette, Ill.

Gorlube—Goshen Rubber Co., Inc., P. O. Box 517, Goshen, Ind.

Grade CA-608 and CA-610—Carmet Division, Allegheny Ludlum Steel Corpn., Pittsburgh 22, Pa.

Hasko-Preg—Haskelite Mfg. Corpn., Grand Rapids, Mich.

Hayden Drill Blanks—Hayden Twist Drill Co., 8626 Lyndon Ave., Detroit 38, Mich.

Hevimet—Carboloy Department of General Electric Co., 11147 E. Eight Mile Ave., Detroit 32, Mich.

Homalite CR-39—Homalite Corpn., 11-13 Brookside Drive, Wilmington, Del.

HZM-100—Harvey Aluminum Division, Harvey Machine Co., Inc., Torrance, Calif.

Imprex—Tincher Products Co., Sycamore, Ill.

Inco-Rod "A"—International Nickel Co., Inc., Bayonne, N. J.

J & L 1113, 1213 and Type "A" Leaded Steels—Jones & Laughlin Steel Corpn., 3 Gateway Center, Pittsburgh 30, Pa.

Jalloy Grade 3—Jones & Laughlin Steel Corpn., 3 Gateway Center, Pittsburgh 30, Pa.

K21—Kennametal Inc., Latrobe, Pa.

K186—Kaiser Aluminum & Chemical Corpn., 1924 Broadway, Oakland 12, Calif.

Kodagraph Contact Paper Translucent—Eastman Kodak Co., Rochester 4, N. Y.

Kolmetal—Emjay Maintenance Engineers, 327 Union Ave., Rutherford, N. J.

L-930 Surface Casting Resin (Metallic)—Rezolin, Inc., 5736 W. 96th St., Los Angeles 45, Calif.

Lamicor—Strick Plastics Corpn., 31-06 38th Ave., Long Island City, N. Y.

Laqua—Fidelity Chemical Products Corpn., 470-474 Frelinghuysen Ave., Newark, N. J.

Liquid Adhesive—Cycleweld Products Division of Chrysler Corpn., Detroit 31, Mich.

Lurium L, L5, L10, and L20—Fromson Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y.

Marvibond—Enamelstrip Corpn., Allentown, Pa.

Metalset (A 101)—Smooth-On Mfg. Co., 572 Communipaw Ave., Jersey City, N. J.

Met-L-Chek Flaw Finder—Met-L-Chek Co., Box 187, 121 N. Prairie Ave., Hawthorne, Calif.

Microstrip—Penn Precision Products, Inc., 501 Crescent Ave., Reading, Pa.

Molykote 165X—Alpha Molykote Corpn., 65 Harvard Ave., Stamford, Conn.

Murex Croloy—Metal and Thermit Corpn., 100 E. 42nd St., New York 17, N. Y.

Neolag—Main Products Corpn., Dept. 562, 1241 Carpenter St., Philadelphia 47, Pa.

Nerva-Kote Tae—Nerva-Kote Division, Rubber & Plastics Compound Co., Inc., 30 Rockefeller Plaza, New York 20, N. Y.

Nickel-Clad Steel Strip—American Silver Co., 36-07 Prince St., Flushing 54, N. Y.

Nickel-Silver Strip—Industrial Division of American Silver Co., Inc., 36-07 Prince St., Flushing 54, N. Y.

66S—Harvey Aluminum Division, Harvey Machine Co., Inc., Torrance, Calif.

5083—Kaiser Aluminum & Chemical Corpn., 1924 Broadway 12, Oakland, Calif.

No. 131 Behr-cat Flatback Tape—Behr-Manning Division, Norton Co., Troy, N. Y.

No. 576.1 Permagum—Presstite Engineering Co., 3798 Chouteau Ave., St. Louis 10, Mo.

Oakite Composition Nos. 160 and 191; Compound No. 131; Crys-Coat SW; Pickle Control No. 5; Rustripper—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.

Octastrip—Octagon Process, Inc., 15 Bank St., Staten Island N. Y.

Olympic FM—Latrobe Steel Co., Latrobe, Pa.

Ottawa 60—Allegheny Ludlum Steel Corpn., 2020 Oliver Bldg., Pittsburgh 22, Pa.

Peel Filmite—DuBois Co., Inc., 1120 W. Front St., Cincinnati 3, Ohio

Names and Addresses of Manufacturers of Products Listed

Penntemp—Penn Precision Products, Inc., 501 Crescent Ave., Reading, Pa.

Plastik-Tul—Industrial Development & Mfg. Corpn., Needham, Mass.

Porcenell—Allied Porcenell, Inc., 851 S. Market St., Waukegan, Ill.

Porous Silver Alloy—Micro Metallic Corpn., 30 Sea Cliff Ave., Glen Cove, N. Y.

Proseal No. 16—Promat Division, Poor & Co., 851 Market St., Waukegan, Ill.

Puritan Penetrant—Olin Mathieson Chemical Corpn., 10 Light St., Baltimore, Md.

PV-845—Specialty Coatings, Inc., 1085 Allegheny Ave., Oakmont, Pa.

RC 130B Wire Fasteners—Camcar Screw & Mfg. Corpn., 629 Eighteenth Ave., Rockford, Ill.

Rem-Cru A-110AT—Rem-Cru Titanium, Inc., Midland, Pa.

Rossaul Copper-Brite—Rossaul Co., 170 Fifth Ave., New York 10, N. Y.

Royal Hardening Powder—Anti-Borax Compound Co., Inc., 1506 Wall St., Fort Wayne 6, Ind.

RSNI—Handy & Harman, 82 Fulton St., New York 38, N. Y.

Rubalt "RA"—Alfred Hague & Co., 227 34th St., Brooklyn 32, N. Y.

Rustgon—Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif.

Rycut 20 and 40—Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill.

Scotchply Reinforced Plastic—Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.

Siliconized Witch Oil—Mitchell-Bradford Chemical Co., 2446 Main St., Stratford, Conn.

Solo-Phos—Whitfield Chemical Co., 14225 Schaefer Highway, Detroit 27, Mich.

Stain-Alloy—Alloy Metal Powders, Inc., 238 Eagle St., Brooklyn 22, N. Y.

Stressproof Steel Bars—LaSalle Steel Co., 1412—150th St., Hammond, Ind.

Styron 480—Dow Chemical Co., Midland, Mich.

Sure Grip—Colonial Refining & Chemical Co., National Broadcasting Co. Bldg., Cleveland 14, Ohio

SweTite Paste Solder—Alpha Metals, Inc., 56 Water St., Jersey City 4, N. J.

Tamper Proof Sealer EC-1252—Adhesives and Coatings Division, Minnesota Mining & Mfg. Co., 423 Piquette Ave., Detroit 2, Mich.

Tecsolv No. 427—Tect, Inc., Cortlandt and Erie Sts., Dumont, N. J.

Texaco Drawing Compound No. 3; All Temp—Texas Co., 135 E. 42nd St., New York 17, N. Y.

Thred-Gard—Crane Packing Co., Dept. MYN, 1800 Cuyler Ave., Chicago 13, Ill.

Tisco 150-Y—Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

Titanium Carbide—Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Titanium Lock-Nuts—Elastic Stop Nut Corpn. of America, Union, N. J.

Titanium Strip and Foil—Industrial Division, American Silver Co., Inc., 36-07 Prince St., Flushing 54, N. Y.

Toolplastik L-900 and Toolplastik Gelkote L-910—Rezolin, Inc., 5736 W. 96th St., Los Angeles 45, Calif.

Triclene D—Electrochemicals Dept. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.

Tungstide—Lockrey Co., Southampton, N. Y.

Type 202—Solar Aircraft Co., 2200 Pacific Highway, San Diego, Calif.

Ucon—Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y.

Unionweld—Union Steel Corpn., Union, N. J.

Vantrol 5299M and 5541—Van Straaten Chemical Co., 546 W. Washington Blvd., Chicago 6, Ill.

Vaporite Industrial White Ink and Jiffy-Rite Fountain Pen—Time Saving Specialties, 2816 Dupont Ave. S., Minneapolis, Minn.

Vacso 4650-A — Vanadium-Alloys Steel Co., Latrobe, Pa.

Walloy No. 6—Wall Colmonoy Corpn., 19345 John R St., Detroit 3, Mich.

Waspaloy—Pratt & Whitney Aircraft Division of United Aircraft Corpn., East Hartford 8, Conn.

X7079—Aluminum Co. of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.

ZeVeScal—Calumet Steel Castings Corpn., 1636 Summer St., Hammond, Ind.

ZRC—Sealube Co., Wakefield, Mass.

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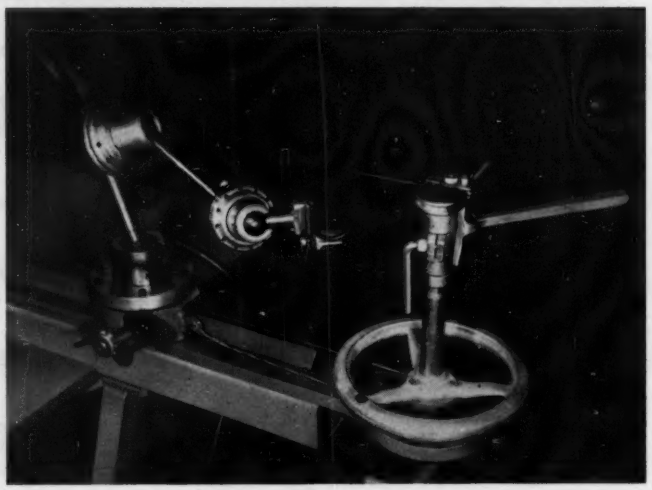
Reprints of Apprenticeship Article

Reprints of the article entitled, "Industry Training Pattern Set by Lockheed" by Reginald Perry, which appeared in April, 1955, MACHINERY, are available. The article describes in detail how apprentices are trained in Lockheed's Burbank, Calif., and Marietta, Ga., plants, and the related classroom instruction which supplements the on-the-job training. Also explained is the training for occupations not requiring the versatility and technical knowledge provided by apprenticeship. Reprints of the article may be obtained from the Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C. Mr. Perry is an information representative for the Bureau.

Ingenious Device for Bending Small Tubing



By E. A. De Voss
Standard Tooling Department
Northrop Aircraft, Inc.
Hawthorne, Calif.

MORE than 1250 thin-walled tubes made of aluminum and stainless steel, which total approximately a mile in length, are required on the Northrop all-weather interceptor fighter airplane. Some of these tubes transport fluids at pressures up to 3000 pounds per square inch or at velocities approaching 600 miles per hour. Tubes transport fuel to the jet engines; deliver hydraulic pressure to operate the landing gear and control surfaces; and transport hot gases from the jet engines to the leading edges of the wing, stabilizer, and engine intake scoops for de-icing purposes. There are tubes that supply oxygen to the pilot and radar observer, fluid to the fire control system, alcohol to the fuel filters, and fuel to the tanks in the airplane from one central connection. Tubes are also required in the operation of instruments on the control panel.

Generally speaking, the quantity of bent tubes required of one outline is comparatively small, so the practice has been to perform the bending operation of small-diameter tubes on devices that are operated manually or on automatics that require excessive set-up time. Recently Northrop tool engineers developed an ingenious device which can be quickly set up to duplicate from the template for the making of any bend. After the required quantity of parts has been bent accordingly, the device can be adjusted to duplicate the conditions of the second bend on the same tubing. This procedure is followed until the multiple number of bends required can all be made on the part in exact duplication. The equipment is

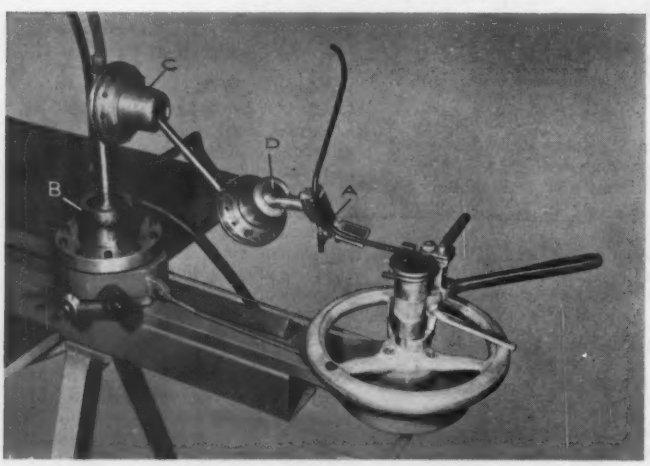


Fig. 1. Universally adjustable device which duplicates from a template, the set-up required for multiple bending of thin-walled metal tubing

customarily used on 1/4-inch diameter tubing having a wall thickness of 0.035 inch.

The basic difference between this bending device and other hand-manipulated equipment lies in the use of three ball and socket units which enable a double backstop *A*, Fig. 1, to be placed in any required position for locating one end of a tube at the beginning of a series of operations and then locating the same tubing in the vicinity of a previous bend for completing the several bending steps required on the part. The ball and socket units are seen at *B*, *C*, and *D*. They are clamped in desired settings by depressing a foot-operated pneumatic valve to actuate diaphragms that clamp the ball element of each unit. This prevents the ball element from moving during bending operations.

In setting the device for the first step in a series of bending operations, the air pressure is released from the ball and socket units of the indexing arms. The first bend of the tubing template is nested into the bend-block, and the clamp-block is tightened, holding the template in place. The adjustable backstop *A*, Fig. 1, is placed against the end of the template, then the foot valve is depressed to effect the clamping action on the ball-socket duplicating arms. The degree of bend-stop is set from the template and locked.

The template is removed and the tube is clamped in place in the bend-block with one end against the backstop *A*. This provides for the correct distance from the end of the tube to the first bend, and for the degree of the bend.

The first bend is made and checked in the machine for spring-back by placing the template over the tube, the degree of bend-stop is re-set to compensate for spring-back, the bend is then completed in agreement with the template. The balance of first bends are then run off on the same set-up.

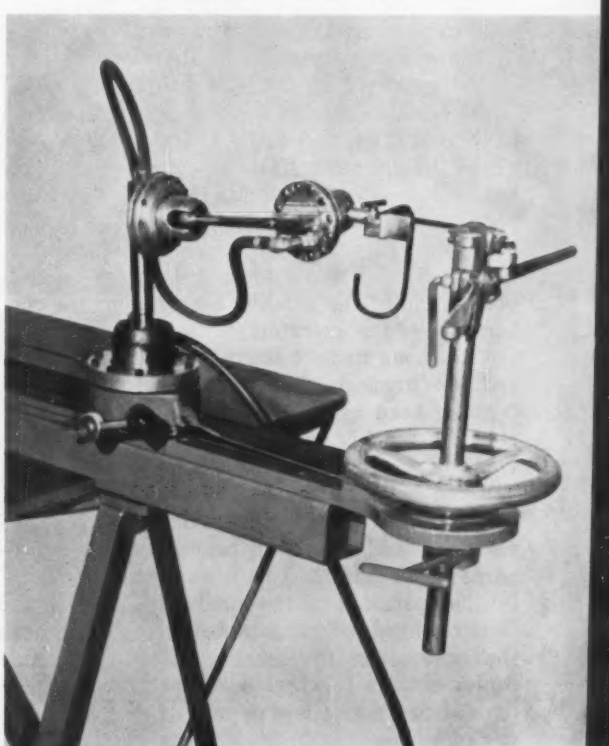
In making each setting for subsequent bends, the pneumatic pressure is released and the ball and socket units are adjusted into position so that the stop can accommodate a surface of the template of the previous bend. The arrangement of the stop for subsequent operations will be apparent from reference to the various illustrations. The manner in which the ball and socket units are connected to each other and the method of attaching the pneumatic line are seen in Fig. 2.

The first piece of tubing bent after an adjustment of the device has been made is carefully checked in relation to a template formed from 1/4-inch diameter rod. The adjustments necessary to compensate for spring-back are then made in order to produce the tubing to correspond to the template. The same practice is followed after each new setting of the stop has been made.

The template enables checking the degree and location of a bend, the distance between bends, and the angles between bends. After a tube has been bent to the requirement of the template, all subsequent tubes of the order are bent without necessity for checking each individual bend.

The bending head is of a conventional design and is mounted on a vertical shaft at the front end of the equipment. Each tube is clamped to the head by means of a lever-operated toggle. A straight clamping block is located opposite a flat area on the bending block, tangent to the bend radius. During early phases of the development of this equipment, slide-blocks were used which wiped against the outer half of the tubing surface as the tube was progressively bent around the block. Later, the straight block was substituted, which is similar to a normal sliding block but is of sufficient length to rotate around the perimeter of the bending block without any sliding action. There is a roller cam that rotates on an axis concentrically with the bending block. It holds the block against the outer half of the tube and progresses tangentially to the bending

Fig. 2. Illustration showing the method of connecting two of the ball and socket units and attaching the pneumatic line



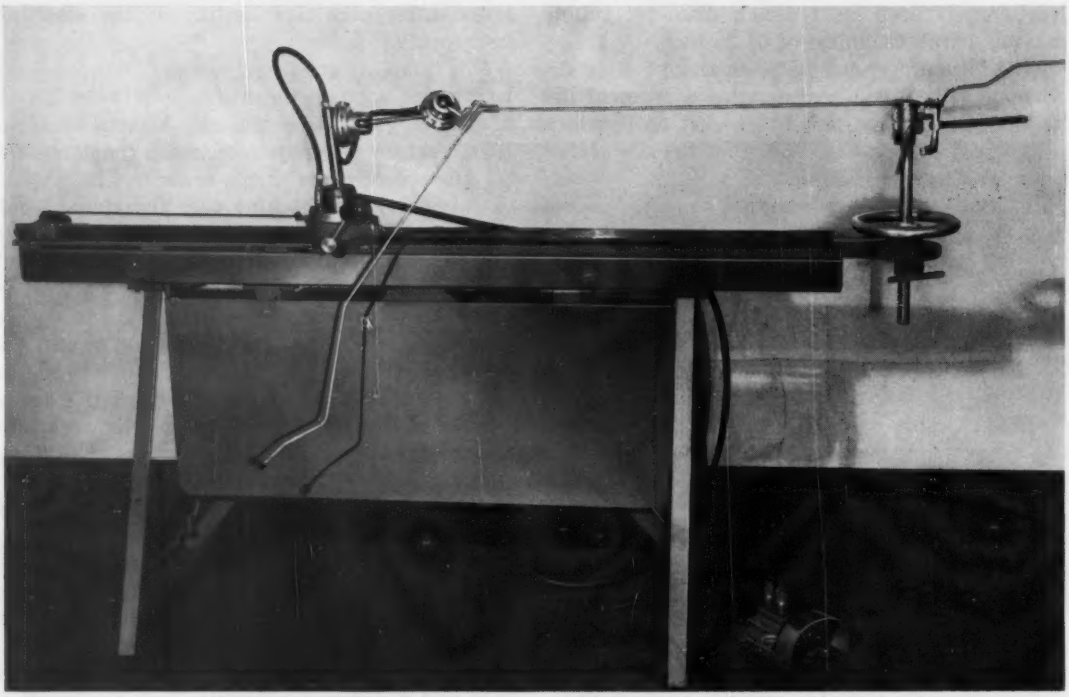


Fig. 3. General view of the ingenious hand bender which illustrates the range of work that can be accommodated

block throughout the full movement required in making a bend. This construction minimizes friction and eliminates galling that was previously encountered, especially on softer tubing.

The amount of rotation of the straight block, or the extent of the bend, is limited by locking the adjustable stop in a position corresponding to the requirements of the tubing template or a sample tube. The vertical shaft that supports the bending block and serves as the axis of rotation for the wiper-block is provided with a keyslot that allows positioning of the wiper-block without rotation. This shaft also enables vertical positioning of the bending head to suit the convenience of the operator.

Variations in tube diameters and in bending radii are arranged for by changing the complete bending head assembly. The various sizes available are quickly interchangeable and are provided with a split-bushing clamping device. The ball and socket units may be conveniently moved along the 5-foot table to accommodate tubes of various lengths between bends, as will be apparent from Fig. 3. This is easily accomplished by the operation of the handwheel beneath the bending head which actuates a cable to move the base along the machine table. With this equipment, an inexperienced operator can produce almost four times as many tubes as an experienced operator on conventional hand benders.

Advertising Inquiry Response and Follow-Up

Advertising Controls Inc., Cincinnati, Ohio, announces a positive control of industrial advertising inquiry response and prospect follow-up. The copyrighted system, named "Exact," includes an ingenious six-part, one-time carbon form which provides check-list spaces for all information an inquiry normally carries, and arranges it for subsequent referral and follow-up of the prospect.

A primary classification by the sales manager enters the inquiry into a process which includes a same-day inquiry response, a referral to the proper salesman or dealer (if the classification so indicates), follow-up letters to the prospect, reminders to the salesman at predetermined intervals, and a referral back to the sales manager should the prospect reach a "buying mood." The system also provides for removal of the prospect from process when a sale has been completed or when certain other conditions arise.

Included with the system is all necessary physical equipment required for its operation, with a step-by-step manual of procedure, and analysis forms for periodical checking of results. A bulletin about "Exact" is offered free upon request to Advertising Controls Inc., 2330 Victory Parkway, Cincinnati 6, Ohio.

Turret Lathe Fixture with Pivoting Feature for Gate-Valve Bodies

FIVE work-holding positions provided for in a turret lathe indexing fixture enable one manufacturer to complete the machining of gate-valve bodies in a single set-up. In addition, seat rings are installed in the bodies and faced in the same cycle. With slight tooling change-overs, four sizes of valve bodies—2, 4, 6, and 8 inches—can be handled, as requirements may dictate.

The general appearance of the fixture is seen in Fig. 1. This is a view over the bed of the machine, a Gisholt No. 3L cross-feeding saddle type turret lathe. The work *V*, in this instance a 4-inch gate-valve body, is nested in the yoke *Y* of the fixture. This yoke is held on trunnions in the fixture frame and thus can be indexed. Locks and positive stops accurately locate the work in

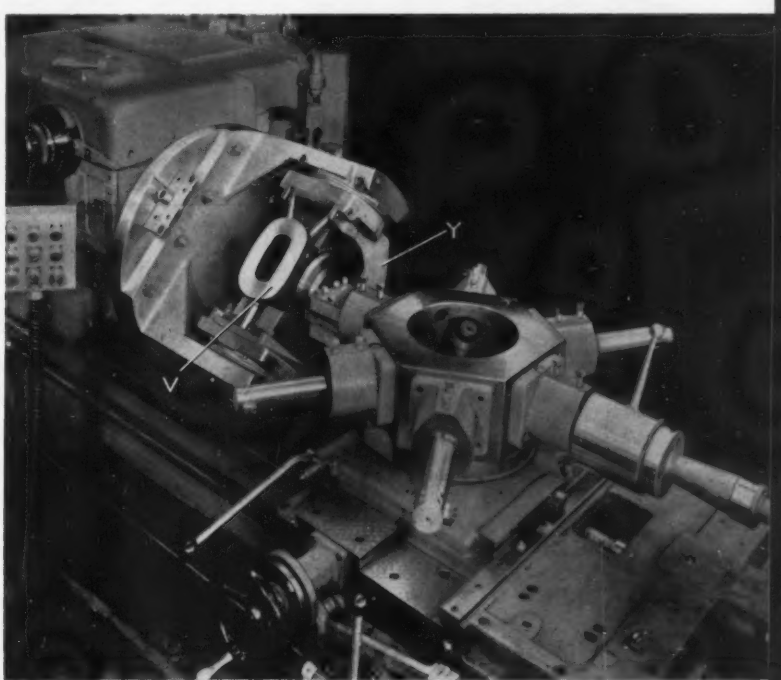


Fig. 1. (Right) At the beginning of the cycle, yoke (Y) is perpendicular to the center line of the machine spindle.

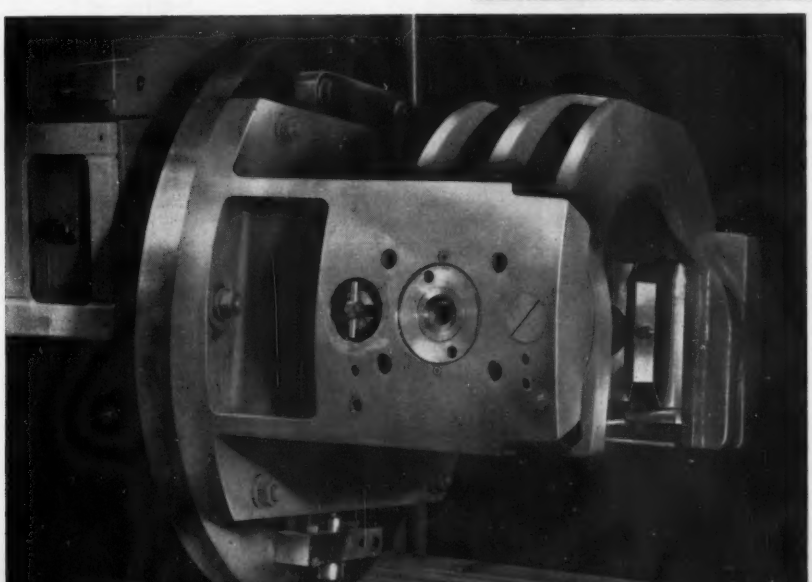


Fig. 2. (Left) This view illustrates how the yoke is joined to the fixture frame.

five different positions for machining. In two positions, the valve faces are normal to the spindle; in another position, the bonnet surface is normal to the spindle; and in two more positions, the angular valve-seat areas are normal to the spindle. Provision for the indexing action of the yoke can be seen in the close-up view, Fig. 2.

Letters on the cross-sectional drawing of the work in Fig. 3 identify the various surfaces machined in the cycle. All operations are completed from the hexagon turret. The inherent cross-feed of the saddle makes a side carriage unnecessary. The tooling at each of the six turret stations is represented by the series of drawings in Fig. 4.

After the valve body casting is loaded in the fixture, the outside cutter at the first station faces *C* and *D* and turns *B*; the central comb cutter grooves *D*; and the inside cutter chamfers *E*. (Fig. 1 shows the central cutter grooving *D*.) Then, the fixture yoke is indexed 90 degrees to present the top of the valve body to the tooling, and the bonnet surface *A* is faced with the outside cutter at

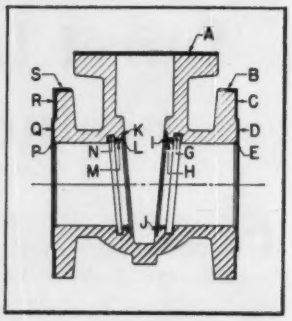


Fig. 3. Letters identify all surfaces completed in the machining cycle.

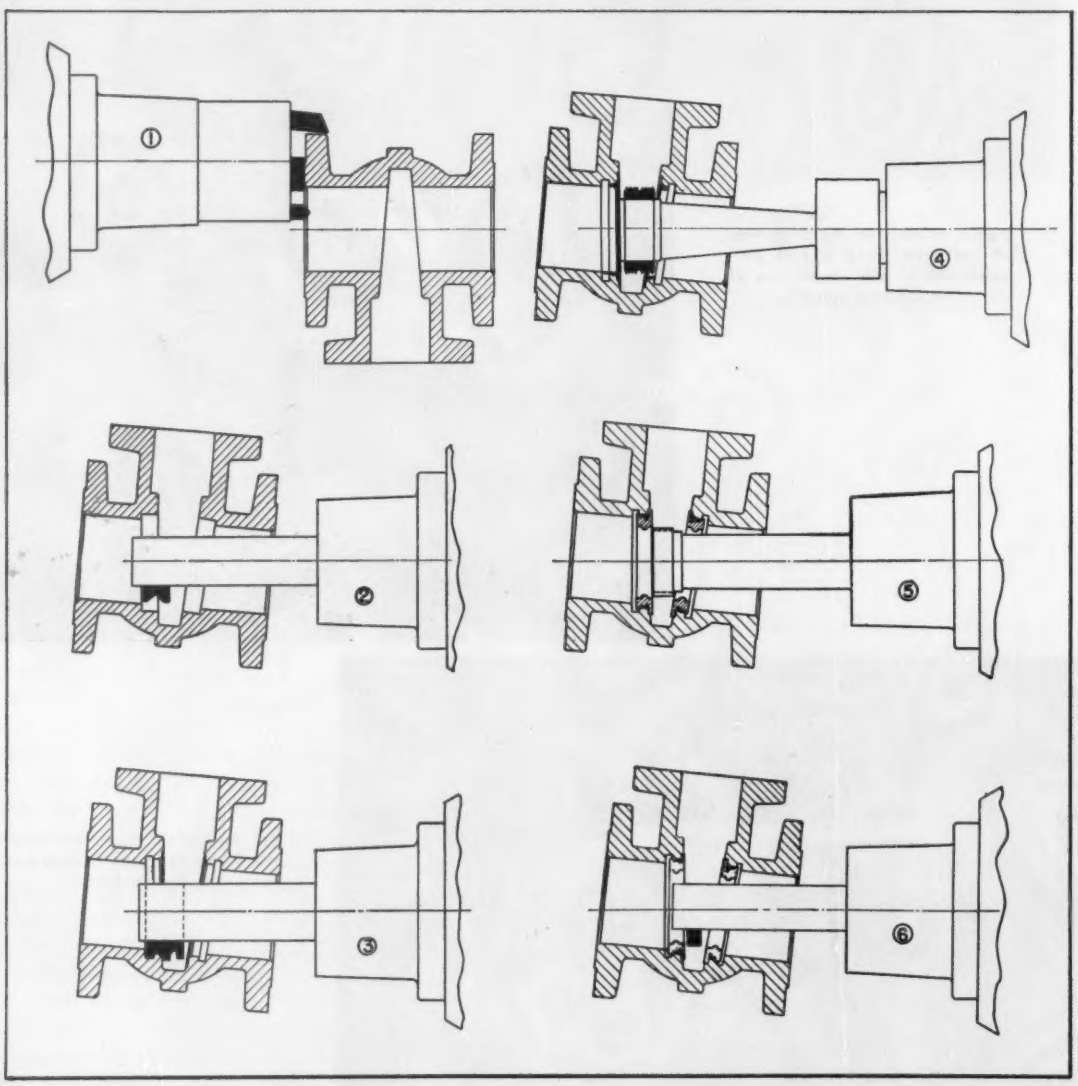


Fig. 4. A diagrammatic representation of the hexagon turret set-up

the first station. Another 90-degree index brings the other valve face into machining position, and *R*, *Q*, *S*, and *P* are completed identically to *C*, *D*, *B*, and *E*.

Operations on the two angular valve seats are performed by shifting the fixture so that the center line of each seat coincides with the machine center line as the work is alternately indexed 5 degrees in each direction from its initial perpendicular relationship to the machine spindle. A fishtail cutter at the second station roughbores thread diameters *H* and *M*; and at the third station, a form cutter produces surfaces *N*, *L*, and *K*, and *G*, *I*, and *J* in sequence.

Threads are cut into the valve-seat diameters by the collapsing tap supported from the turret face of the fourth station. Each of the tap chasers is divided into two sections; cutting edges on the left-hand sections face to the rear, and those on the right-hand sections face forward. With the valve body in the position illustrated in the drawing, the left-hand sections of the chasers cut the thread in *M*. In cutting the thread in *H* with the right-hand sections, the yoke is first indexed to the corresponding angular position, as was done in the preceding operations on the valve-seat areas. In addition, it is necessary to reverse the rotation of the spindle and the feed of the carriage.

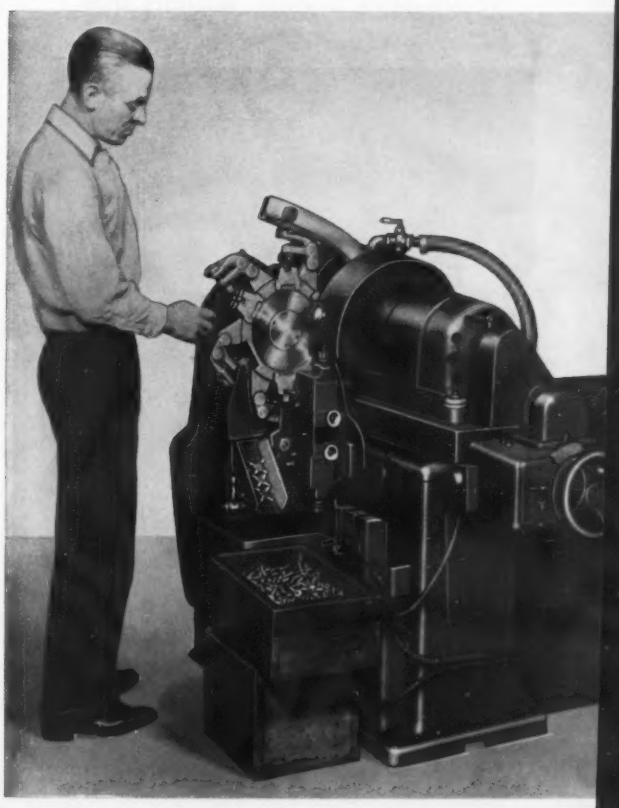
A ring is next installed in the right-hand valve seat, being screwed in manually and then brought up tight by the thrust of an arbor at the fifth station as the spindle rotates slowly in reverse. The ring-seating operation utilizes an adjustable torque control switch which is actuated from a "seat-run" button. The switch regulates the flow of current to the electrically controlled headstock clutches which slip when sufficient torque has been applied to seat the ring. After changing the spindle to forward rotation and indexing the fixture, the procedure is repeated in installing a ring in the left-hand valve seat.

At the sixth station is performed the final operation of taking a light cut over the face of the rings. The cutter, like those at the second and third stations, is symmetrical and has a clearance angle ground on each side. The positive stop in each position prevents any accumulation of errors. Floor-to-floor time for a 4-inch valve body is thirty-six minutes.

Drum Type Fixture Holds Work on Double-Disc Grinding Machine

Various classifications of work-holding fixtures are used on double-disc grinding machines. One such classification distinguishes between a fixture which confines the part as it passes between the grinding discs, but in which the work-piece is permitted a degree of float, and a fixture that clamps the part solidly. Passing work-pieces between the discs while held in a floating type fixture often provides greater production rates when parallelism, flatness, or size are the only important considerations.

In cases where the ground surfaces must be held to close tolerances with some locating surface, individual solid clamping is recommended. Clamping of this type is provided on a double-disc grinding machine manufactured by Mattison Machine Works, Rockford, Ill. This machine, shown in illustration, has a six-station rotary-drum type fixture with individual clamps for each part. The work-piece in this case is a 3-inch universal-joint spider. A production rate of 750 spiders per hour is obtained, with four surfaces on each work-piece being ground.



Double-disc grinding machine clamps work-pieces securely on a six-station rotary-drum type fixture.

Abrasive Cutting Increases in Popularity

By E. J. DeWitt, President
Wallace Supplies Mfg. Co., Chicago, Ill

SQUARE, accurate, practically burr-free ends are possible today when stock is cut off with a dry abrasive wheel. In a great many instances, ends so produced require no further machining. With improved wheel designs and several good, low-cost cut-off machines available, use of the method has been expanding rapidly.

It is now possible to buy wheels from many sources capable of producing ends that are relatively free from burrs and burn, and without the inconvenience of wet-cutting. New resinoid bonds used in these wheels have modified the concept of dry abrasive machining from one of sawing to one of cutting.

Examples of the quality of cut obtained with the proper combination of wheel and machine are illustrated in the close-up views, Figs. 1 and 2. The work in Fig. 1 is a 347 stainless-steel tube having an outside diameter of 3 inches and a wall thickness of 1/16 inch. It can be seen that there is practically no burr, only a few fine ribbons of metal still clinging to the cut end. Time for making the cut was just two and one-quarter seconds.

Like the tube, the I-beam in Fig. 2 is clean, square, and for all practical purposes, free of burrs. Cutting time was ten seconds. As for accuracy, when these cut-off parts were set on a surface plate and moved under a height gage, the greatest difference measured from piece to piece was only 0.039 inch. In any one piece, parallelism was within 0.016 inch.

Abrasive sawing need not be limited to simple cutting-off jobs. One successful application is for forming the teeth of an 18-inch ratchet wheel for a bending machine. Previously, the teeth were flame-cut to a template with an oxy-acetylene torch. Clean-up and filing took four or more hours per wheel.

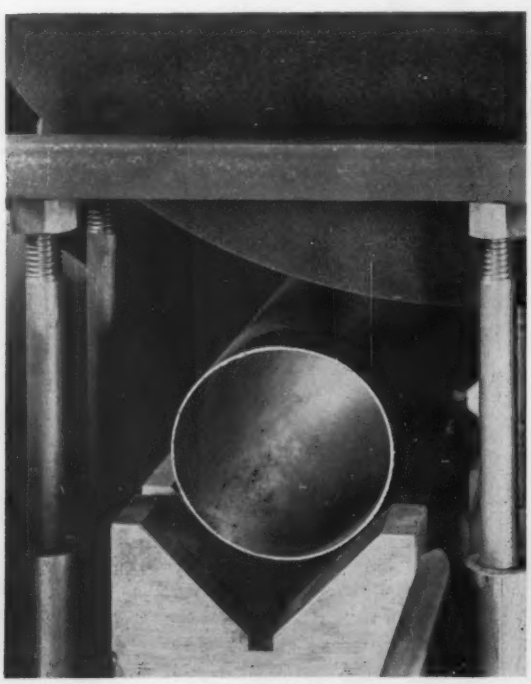


Fig. 1. No heavy burr, only a few fine ribbons are left by the wheel in cutting stainless steel tubing

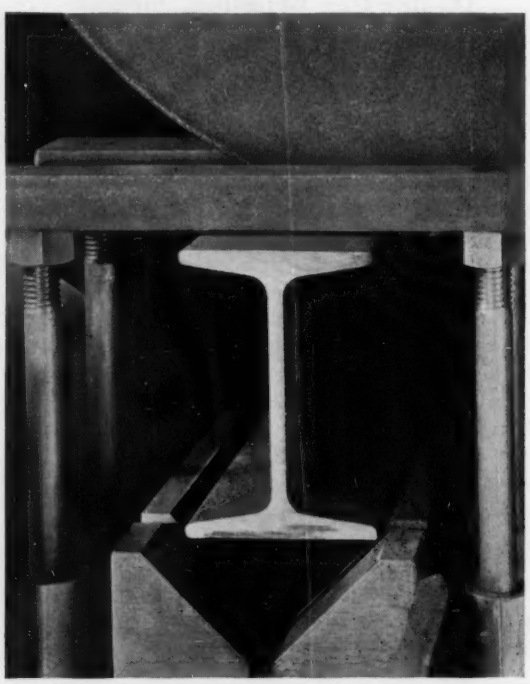


Fig. 2. This I-beam was cut off with a dry abrasive wheel in ten seconds, clean and square

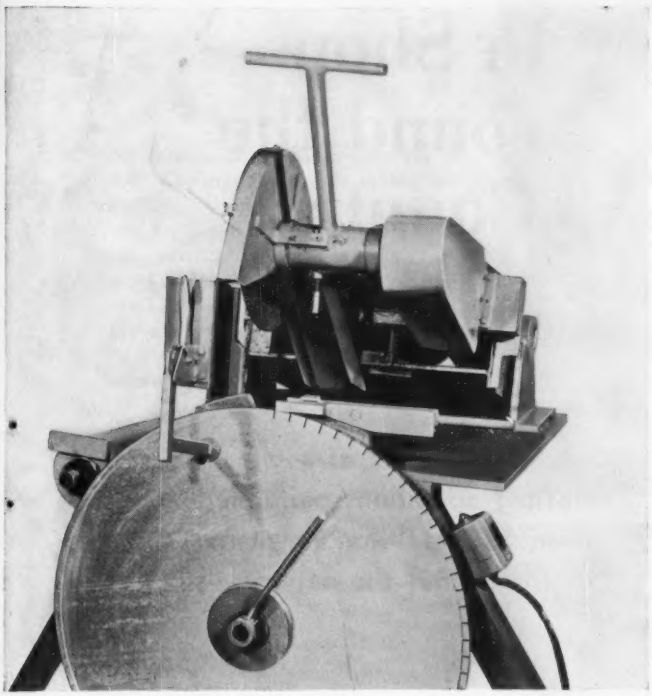


Fig. 3. To gash the work, it is centered directly beneath the abrasive wheel

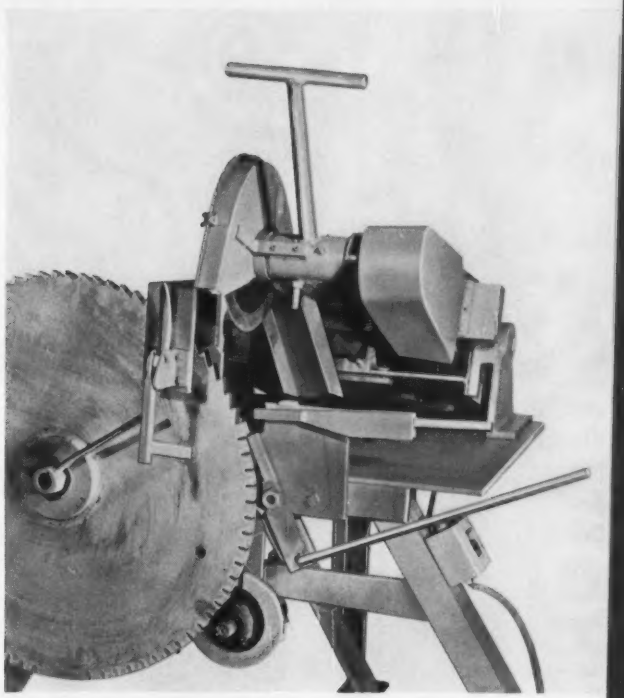


Fig. 4. The teeth are completed with the work positioned to one side of the abrasive wheel

A special abrasive saw makes it possible to complete a wheel in about fifty minutes, including deburring, which now, incidentally, can be done with a wire brush on a portable grinder. Two settings of the work are involved. In the first setting, Fig. 3, the center of the ratchet wheel is aligned with the abrasive wheel. The work is cut on a radial line to the required depth. A finger, located in the first cut, is used as an index for all subsequent cuts. In the second setting, Fig. 4, the work is revolved with its center to one side of the abrasive wheel, and the angle cuts are made.

Rules for abrasive sawing practice are few and simple. Machines should be of good manufacture, and specially designed for metal-working. Work-holding fixtures must be adequate. A selection of wheel sizes and types should be kept on hand, since a wheel that does the most efficient job on a heavy section may give poor results on a light section.

* * *

About one-fourth of the steel ingot normally becomes scrap metal and goes back into the furnaces. The three-quarter ton of finished steel from a ton of ingot steel will make five freezers, six and one-half refrigerators, seven automatic clothes washers, one-half a car, or one small tractor.

New Plating Process Deposits Crack-Free Chromium

A new production plating process that plates "Crack-Free Chromium" directly on steel was recently introduced by United Chromium, Inc., New York City. The plate provides a barrier that is practically impenetrable and needs no undercoat of nickel, or copper and nickel. The new plate is deposited free of any structural imperfection and has other desirable properties including a low coefficient of friction, excellent adhesion, a non-galling surface, and superior ductility. It has an attractive light gray matte appearance that can be buffed to a high luster.

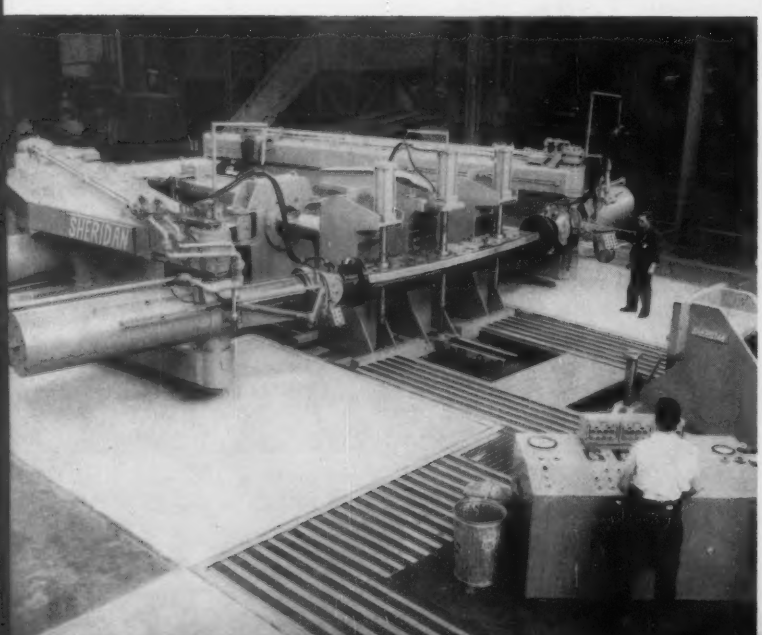
Using standard plating equipment and procedures, a special chromic acid type bath with automatic regulation of the catalyst concentration is prepared by dissolving Unichrome SRHS Compound CF-500 in water. Plating speed is about the same as ordinary chromium.

The Maytag Co., a leading manufacturer of washing machines, has, along with other extensive tests, exposed a steel shaft coated with 0.0005 inch of Crack-Free Chromium to salt spray for 100 hours. The part was practically unaffected. Last February, Maytag, employing a nine-tank automatic plating machine, put into operation the first mass-production plating line using the new process to plate steel and solid copper.

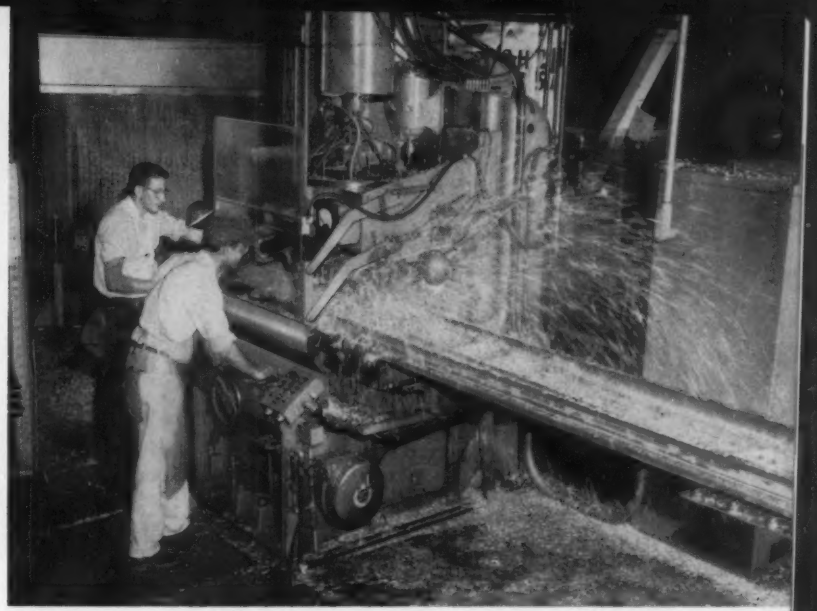
In Shops Around the Country

Camera highlights of some interesting operations performed in various metal-working plants throughout the nation

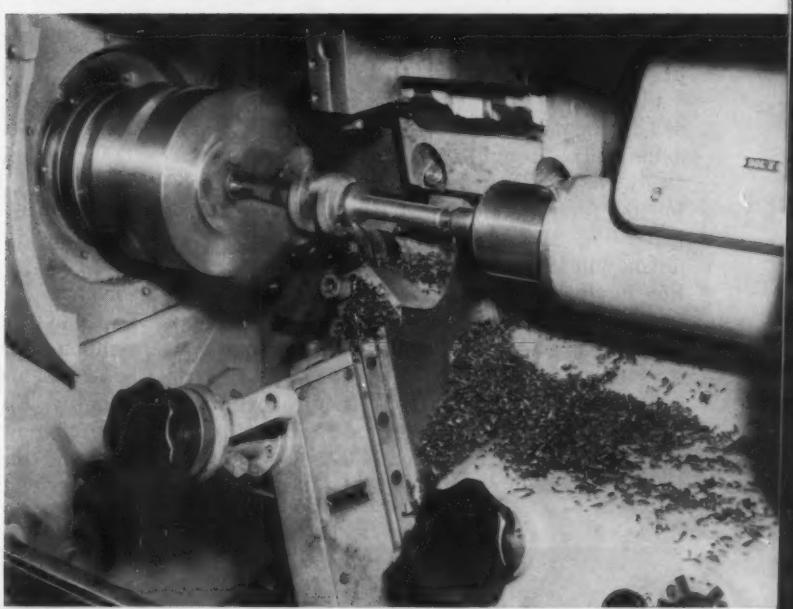
Proof-loading in tension on an airplane arresting hook is performed on a Baldwin universal testing machine at the Axelson Mfg. Co., Los Angeles, Calif. Designed to bring landing airplanes to a quick stop aboard United States Navy aircraft carriers, the 82-inch long hook is made of steel tubing with steel forgings flash-welded to each end.



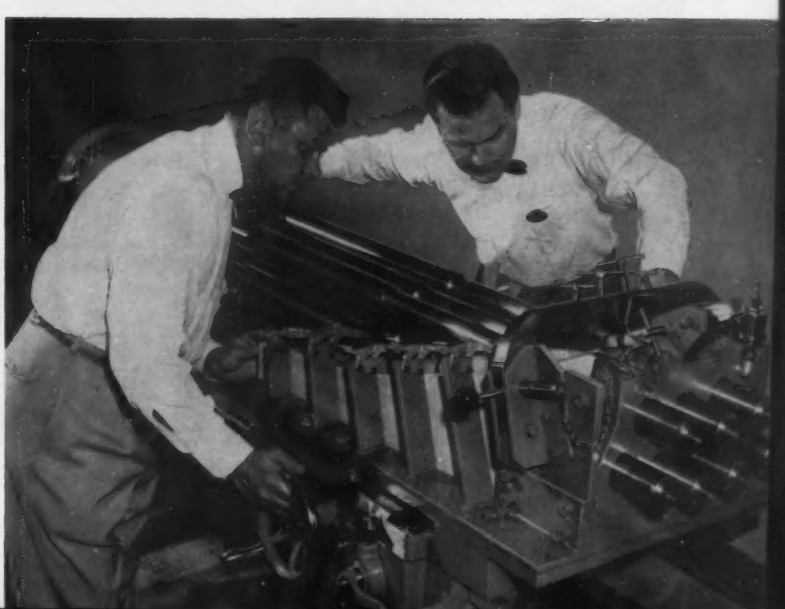
Stretch-forming a 14-foot long wing-chord extrusion for a B-52 Stratofortress at the Boeing Airplane Co., Wichita, Kan. The 180-ton Sheridan press, claimed to be the largest of its type in operation, grips the work between pincers which exert a pressure of 20,000 pounds per linear inch. The die table has a forward movement of 161 inches, and is part of the main body of the press.



An intermediate wing spar for a A4D Skyhawk is profile-milled on an Onsrud Invomil at the El Segundo, Calif., Division of the Douglas Aircraft Co. The operator follows a template, placed over the work-blank, by manipulating a table lever and a stylus wheel. Foot pedals control the vertical movement of the cutter and stylus.



Turning the flywheel and pulley ends of single-throw steel crankshafts at the Clinton Machine Co., Maquoketa, Iowa. The equipment used is a New Britain "GF" tracer lathe tooled with a Wessonmetal Grade 26 carbide cutter insert. A special multicut holder permits the cutter to be indexed four times between grinds.



A lathe headstock adaptation and a carriage-mounted work-fixture permit seven holes for rocket-pod orifices in the F-89 Scorpion to be bored simultaneously at Northrop Aircraft, Inc., Hawthorne, Calif. The work, a concave casting, is held in the fixture by locating pins. Rough and finish cuts are taken progressively, with each bar being piloted in the work-fixture. Machine time is forty-five minutes.

Cold Cleaners for the Metal-Working Shop

By JAMES MCELGIN, Manager, Metal-Working Department
E. F. Houghton & Co., Philadelphia, Pa.

WATER-BASE cleaning solutions are attaining great popularity in many metal-working plants. Completely non-flammable and non-toxic, they simplify the "housekeeping" of machinery and other equipment, and speed the cleaning of parts produced. The solutions require little or no heating, and can be applied by wiping the work, dipping it in a still tank, or processing it through an automatic production line.

Several of these emulsion type cleaners are developments of E. F. Houghton & Co., Philadelphia, Pa. Houghto-Clean 220 is used at relatively low temperatures and does an equally good job on ferrous and non-ferrous metals. It removes oil and dirt without harming surface finish, and leaves a slight film that offers protection against rust between operations or during temporary storage.

For power-washer use, a 2 to 5 per cent solution is used at room temperature. For soak cleaning, it is mixed with water in the proportions of from 1 to 5 up to 1 to 20, and heated to about 160 degrees F. Exceptionally heavy soil is removed by scrubbing with straight cleaner, letting the work set for fifteen minutes, then rinsing either with a hose or in an agitator tank.

In use, the cleaner is instantly miscible, and forms stable, non-foaming emulsions with either hot or cold water. Tank installations of the emulsified solvent can be conveyorized and put in production lines at reasonable cost.

A good cold-cleaning solution can readily remove drawing oils, pigmented compounds, sulphurized cutting oils, rust preventives, polar type smuts, and soils. One important provision is that there be adequate agitation in the bath.

For cleaning in a tank, a combination of two compounds, Houghto-Clean 402 and 403, proves to be efficient and economical. Both have considerable detergency. The 402 compound is a liquid having high surface activity and modified solvency. It is neutral rather than highly alkaline, and produces a translucent solution. The 403 compound is a mildly alkaline powder that is added in small quantities to prevent rust and foaming. An active buffer further improves the cleaning power of the combination, which is used at room temperature.

Efficiency is further increased by agitating the

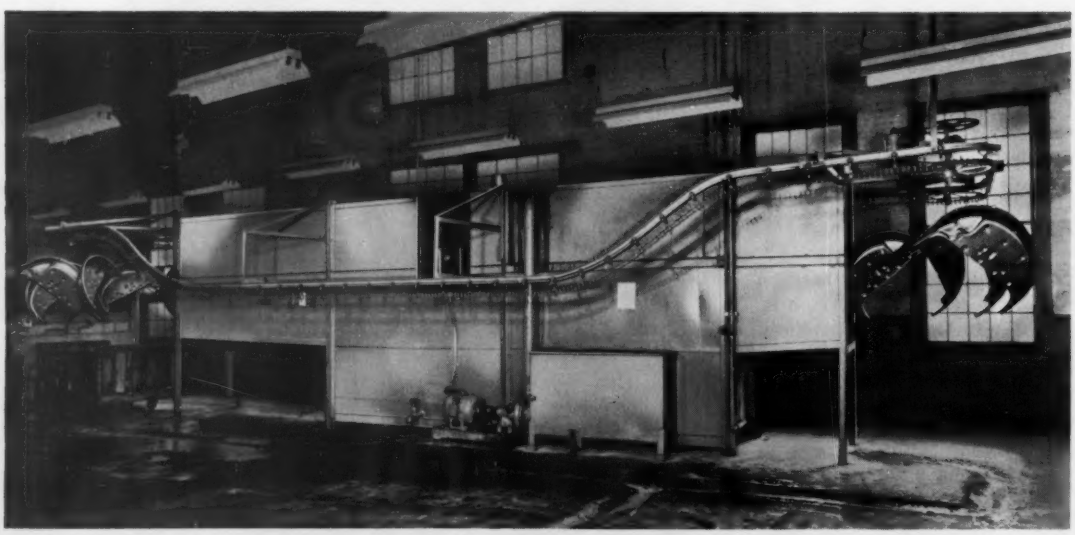


Fig. 1. This power washer in an automobile plant uses a room-temperature cleaner

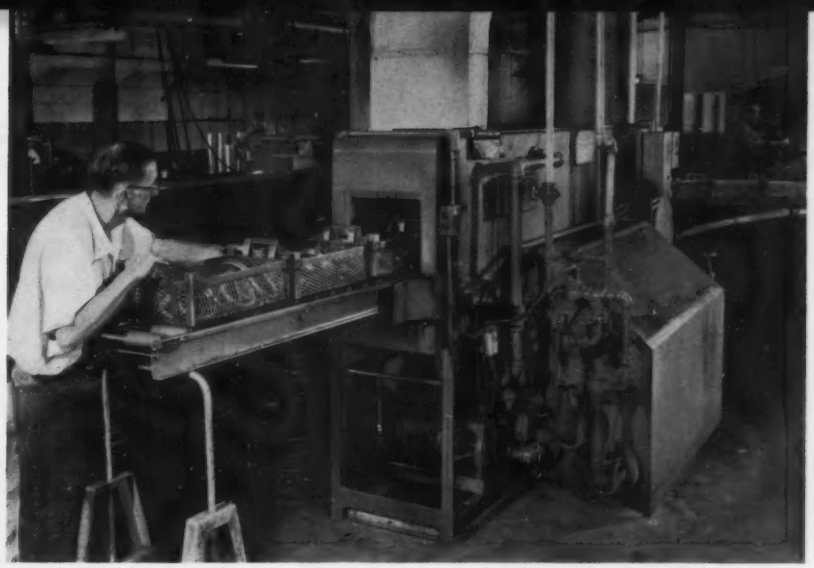


Fig. 2. Bearing races are conveyed through a spray washer for a cold-cleaner treatment

solution in order to carry away the emulsified soil from the surface of the work-pieces. Any form of low-pressure spray, circulation, or hose-off facilities improves the cleaning action, particularly when smuts or buffing compounds have to be removed. The combination can be used in place of solvents and standard hot alkaline cleaners, but cannot be used for such jobs as electrolytic cleaning, paint removal, or cleaning prior to vitreous enameling.

For cold cleaning in production power washers, Houghto-Clean 445 is a speedy wetting agent. It is a slightly moist white powder which contains metasilicates, pyrophosphates, and organic emulsifiers. Like the combination cleaner, it will not produce a chemically clean surface such as that required for vitreous enameling. This cleaner does not cause excessive foam despite vigorous circulating of the solution within the washing equipment.

Metal Show to be Held in Philadelphia

THE Thirty-Seventh National Metal Congress and Exposition will be held in Philadelphia, Pa., October 17 through 21. Displays and demonstrations of equipment, products, and services by hundreds of firms will be presented at the Philadelphia Convention Halls. The Metal Show is sponsored by the American Society for Metals, the American Welding Society, the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, and the Society for Non-Destructive Testing.

Among the more than sixty technical papers to be presented at sessions of the American Welding Society in the Bellevue-Stratford Hotel are: "Electrode Characteristics for Welding Mild Steel in Atmospheres of Carbon Dioxide by the Consumable-Electrode Gas-Shielded Welding Process," by Robert D. Mann and Julian D. Carey, General Electric Co.; "Resistance Spot-Welding Schedules for Welding Projection Hardware to Mild Steel Sheet and Plate," by O. K. Barnes, Westinghouse Electric Corporation; "Power Sources for Inert-Gas-Shielded Consumable Electrode Welding," by A. Lesnewich and Everett Cushman, Air Reduction Co., Inc.; "New Surfacing Techniques," by K. H. Koopman and R. S. Zuchowski, Linde Air Products Co.; "Welding of Titanium," by E. F. Gorman, Linde Air Products Co.; "A New Approach to Welding of Alloy Steels with Alloy Fluxes," by Emmett Smith and Paul Jerabek, Lincoln Electric Co.; "How to Use Steel Effectively in Machinery," by Omer Blodgett, Lincoln Electric Co., "Lower Part Cost by Projection Welding," by C. H. Burgston, Deere & Co., and "Metal Power Electrodes and Their Applications," by E. DiLiberti, Air Reduction Sales Co.

Highlight of the technical sessions of the American Welding Society will be the Adams Lecture to be delivered by LaMotte Grover of the Air Reduction Sales Co. His subject will be, "An Interpretation of Research and Experience in Structural Welding." "Powder Metallurgy in Atomic Energy," and "Ductile Chromium Metal and Its High Alloys" will be the subjects of two-day sessions jointly sponsored by the Office of Ordnance Research, U. S. Army, and the American Society for Metals.

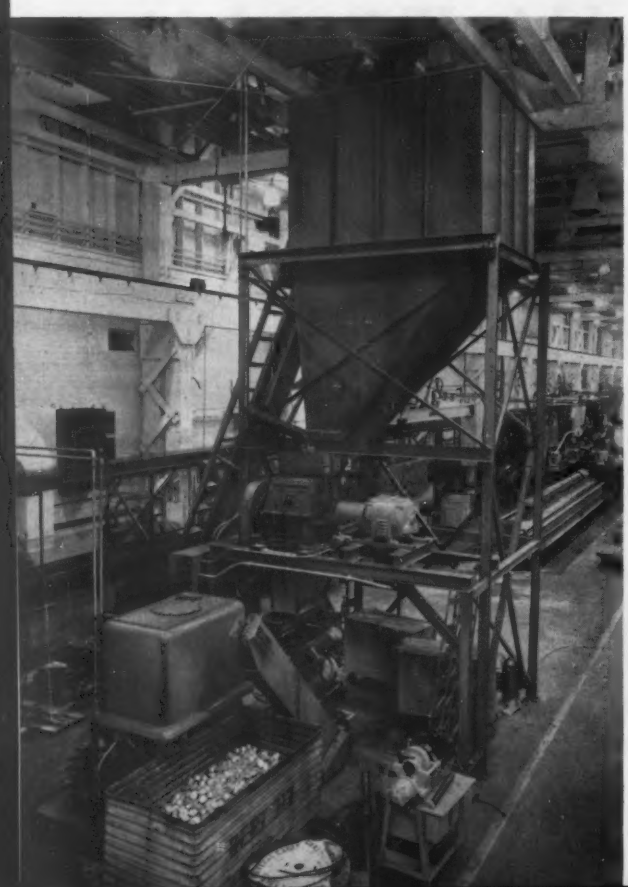
Briquetting Chips Saves Space

THE handling of metal chips that accumulate in metal-cutting operations is a problem in every machine shop. This is especially true in the spar-milling departments of aircraft plants because of the huge quantities of chips produced in short intervals of time. As cutters have been improved and machine feeds and speeds increased, the chip load has grown to proportions that often tax the ingenuity of the supervisory personnel to keep even the milling machine clear, particularly when a line of spar-mills is in operation around the clock.

In the El Segundo plant of the Douglas Aircraft Co., a conveyor system formerly carried the chips overhead from underground drainage pits to the end of the spar-mill line where they were delivered to tote trucks. The chips arrived so fast that a fleet of trucks was in a constant shuttle movement between this location and a dumping area where the chips were loaded on high-sided vans for outside disposal.

To reduce this handling operation, the Milwaukee briquetting press shown in Fig 2 was installed at the end of the spar-mill line. This machine compresses chips into 2 1/2-inch diameter briquettes, approximately 1 3/8 inches long at the rate of fifteen per minute. The briquettes average 1/2 pound each. They are pressed under a piston load of approximately 118 tons.

Fig. 1. Aluminum chips from spar-milling operations are compressed into these small-sized briquettes with resulting economies in handling and storage space.



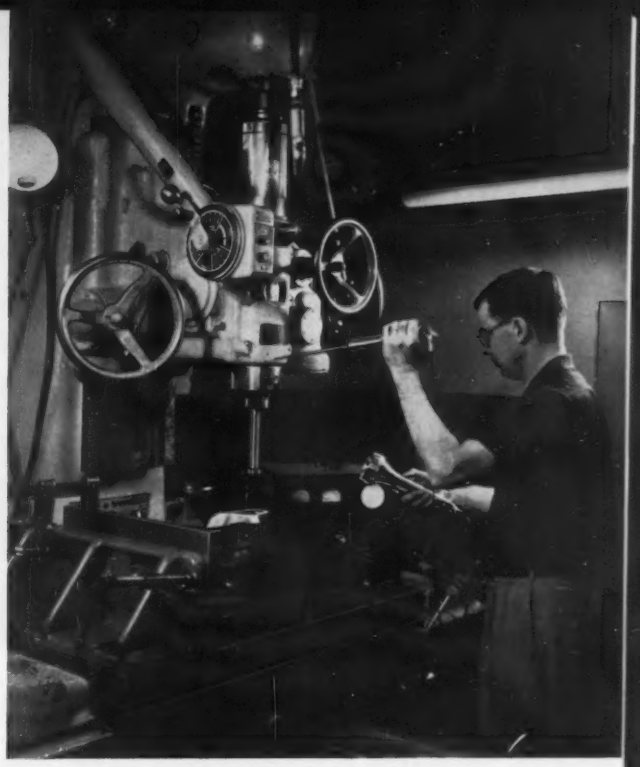
Since this equipment was installed, the handling of chips has been reduced almost 90 per cent and storage space has been cut proportionately. The steel trucks used for transportation of the chips hold 3000 pounds of briquettes at a time, whereas they previously held only 300 pounds of loose chips. The briquettes are conveyed from the machine directly into tote trucks. When loaded, these trucks are towed to the shipping area where they are raised by fork lift trucks and turned upside down to dump the briquettes into the vans. Another advantage of this method of chip handling is the elimination of the wind-blown carpet of chips that formerly existed in the exterior loading area and the pools of oil that seeped through the vans from the chips.

Fig. 2. The briquetting equipment that has been installed at the end of a line of spar-milling machines in the El Segundo plant of the Douglas Aircraft Co.

Vibrations Eliminated

without Major Disassembly

By Arthur R. Crawford, President
International Research and
Development Corporation
Columbus, Ohio



OUT-OF-BALANCE of rotating parts can now be detected by a vibration analyzer that makes unnecessary a major disassembly of a machine or mechanism. The approach taken in designing the equipment did not follow the basic premise that vibration appears as a sine wave. Instead, efforts were directed toward solving the problem resulting from the vector summation of all vibrations produced by a multiplicity of moving parts in a machine.

In many instances the resulting level of vibration is not due entirely to imbalance or some other defect in a single part but is produced by many parts in operation together. Thus, it is quite possible that even after a complete disassembly, balancing, and reassembly of a machine, the level of vibration may still be unacceptable to the inspector, and may still present the problem of location to the engineering department. Such a procedure is not only time consuming and out of place in the light of present day standards of inspection and quality control, but is limited in accuracy to the inspector's judgment.

For example, it is not difficult to balance the headstock spindle of a lathe, once it is known that it is the headstock spindle which produces the undesirable vibration in the machine. An obvious solution is to determine the frequency of the vibration and proceed to locate its source. However, working on the premise that the vibration appears as a sine wave—and thus as a single frequency—often invites confusion.

The International Research and Development Corporation, Columbus, Ohio, in designing the equipment paid considerable attention to making it simple to operate and easy to interpret by production personnel. In addition, it was decided that the three important parameters needed to solve problems of vibration were those of displacement, frequency, and phase. The frequency had to be that of the maximum component of vibration in the machine under test; and the displacement had to be peak-to-peak displacement of the resulting wave shape, irrespective of its being a sine wave or complex function.

Peak-to-peak displacement was, of course, not difficult to measure with a peak-reading circuit. However, intricate electronic design was required to obtain a frequency channel that would faithfully respond to only the maximum component of vibration in a complex mechanism.

To indicate phase, the stroboscopic principle was adopted to advantage. By firing a stroboscopic lamp in exact synchronism with the maximum component of vibration, it is possible to determine the phase of the out-of-balance, and also to determine visually which particular rotating part in a machine is responsible for the major portion of the vibration. In addition to the stroboscope, the basic equipment includes a vibration pick-up, a probe, an amplitude meter, and a frequency meter.

Use of the equipment is demonstrated in the accompanying views. In the heading illustration, a jig borer is being tested at the J. Leukart Machine Co., Columbus, Ohio. While holding the probe and seismic pick-up of the vibration analyzer against the spindle housing, the worker focuses the stroboscopic lamp on the rotating spindle. The probe is attached to the pick-up, and mechanically transmits to it any vibrations in the spindle. The pick-up, a sensitive transducer able to detect vibrations having a displacement as small as 0.000001 inch, converts the mechanical motion of the probe into electrical energy,

Fig. 1. Testing a surface grinding machine with the vibration analyzer. The probe mechanically transmits the vibrations to the pick-up.

with an output of 150 millivolts at 0.001 inch displacement, 100 cycles per second.

The current generated actuates the electronic frequency and displacement circuits in the instrument cabinet. (This particular model contains a band-pass filter and an oscilloscope to give a visual wave trace of the vibration). The current also fires the stroboscopic lamp at the frequency of the vibration, which is the rotational speed of the part under test, in instances where the part is not in balance. Under the light of the lamp, the center of unbalance appears to stand still. Since the pick-up responds to the predominant frequency of vibration, it is possible to determine instantly whether the spindle is the actual source of vibration, or whether another part—or some condition outside the machine—causes the vibration.

By photographing the wave trace on the oscilloscope, or by using an accessory strip chart recorder, data for diagnosing difficulties in other units of the particular model of a machine can be developed. The reactive filter of the instrument employs the elements of capacitance, resistance, and inductance. High-pass filters permit only high-vibration frequencies to be transmitted to the instrument circuitry. Likewise, low-pass filters screen out all but the low frequencies. With band-pass filters, frequencies in bands as narrow as 20 cycles per second can be studied.

A surface grinding machine at the Leukart company is shown being inspected with the vibration analyzer in Fig. 1. This instrument is also equipped with an oscilloscope. Vibration analyzers are particularly useful in maintaining all types of grinders, since the constantly changing diameter of the grinding wheel may introduce out-of-balance.

In Fig. 2, a new engine lathe is undergoing final inspection at the Springfield Machine Tool

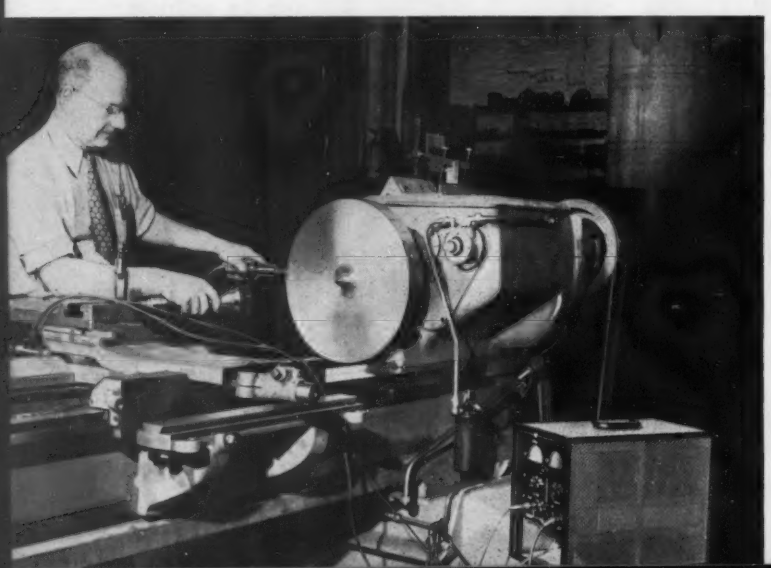


Fig. 2. Final inspection of this lathe by the machine tool builder includes the use of a vibration analyzer to check rotating parts.

Co., Springfield, Ohio. The routine is to check the headstock, gears, belts, and drive motor. Wherever vibration exceeds a tolerance of 0.0005 inch, it is eliminated by balancing the rotating part in its bearings. Where the vibration is traced to a defective belt, the belt is replaced.

The company also uses the vibration analyzer for its service calls. In one case, a Springfield universal vertical grinding machine no longer was able to produce a required degree of surface finish. Inspection with the instrument disclosed that vibrations were being produced by some unauthorized modifications the user had made to the grinder.

The use of the instrument entails four simple steps. First, the part to be balanced is run at normal operating speed, while the inspector observes the phase of an arbitrary reference mark, and the peak-to-peak displacement. Secondly, a trial weight is applied, which as a first approximation, is added in the direction indicated by the probing. The part is again rotated, and the angular shift of the reference mark from its original position is observed.

Next, the trial weight is moved sufficiently in a direction opposite to that taken by the shift of the reference mark to return the reference mark to its initial position. Finally, the trial weight is made heavier or lighter, until an acceptable degree of balance is obtained by readings of the amplitude meter. Four to six runs are usually all that are required, although inspectors familiar with vector analysis are often able to correct the trial weight after a single run.

New Metals and Ceramics Building Expands General Electric Research

DRAMATIC proof of the growing recognition of metallurgy and ceramics as sciences rather than as industrial arts is General Electric's investment in a new Metals and Ceramics Building at the G. E. Research Laboratory at The Knolls, near Schenectady, N. Y. With the formal opening this August of the $5,000,000 building, GE scientists feel they have the world's finest facilities for investigating the structure, properties, and applications of metal and ceramic materials.

Purposes of the building are: (1) development of the new metals and ceramics that emanate from the Research Laboratory, and of the techniques for processing them; (2) enlargement of significant processes to pilot-plant scale; (3) transfer of proven processes to operating divisions of the company; and (4) preparation of metal and ceramic specimens for study elsewhere in the Research Laboratory or in other company divisions.

Activities in the building concern foundry work, vacuum induction melting, fabrication, heat-treating, metal and ceramic powder development, and coating. The fabrication area contains both hot-working and cold-working equipment. Included are an extrusion press, a hot-slabbing and rod mill, a planetary hot-strip mill, a reversing hot mill, forging hammers, cold-strip mills, swaging machines, and a 100-ton press.

A heated block is positioned at the feed end of a Sendzimir planetary mill in the Metals and Ceramics Building of the GE Research Laboratory

Dieing Press Yields Sixty Clutch Plates a Minute

Automatic transmission component is stamped from coils of SAE 1045 steel in a nine-stage progressive die. Spray of soluble oil coolant prevents metal shavings from marring work or clogging the die

By Herbert Chase

A PRECISION stamping used in the Dynaflow torque-converter transmission is being produced by the Buick Motor Division of General Motors Corporation, Flint, Mich. This component is the clutch plate illustrated in the lower left-hand portion of Fig. 1. Each transmission requires the use of five plates.

High-speed production of the clutch plates is accomplished with a nine-stage progressive die mounted in a 20-ton Henry & Wright dieing press, Fig. 2. This machine, which is operated at a rate of sixty strokes per minute, is fed with bright finished SAE 1045 steel coil stock, 5 3/4 inches wide and ranging in thickness from 0.068 to 0.069 inch. The hardness of the coil varies between 24 and 30 Rockwell C.

Before entering the die, the stock passes through a roller leveler and feed-rolls. In Fig. 1 can be seen a section of coil stock that has passed through the die, illustrating the work performed at each of the nine die stations. Below the strip is a finished clutch plate, left, and other groups of punchings that fall from the die at various stations. One group consists of four flat washers to be utilized in other operations. Teeth projecting from the periphery of the plate must be held to close dimensional accuracy with regard to spacing, therefore, their side faces, parallel to the radius, require a shaving step.

As can be seen in the illustration, four small holes are pierced in the strip at the first station. At the second station, nine arc-shaped slots are pierced, forming the spaces between the nine projecting teeth of the clutch plate. Slugs formed at both these stations are pushed through the die. The outer ends of most of the teeth remain joined to the strip.

Four washers are blanked out at the third station, and are also pushed through the die. This enlarges the four holes at the center. At station four, the large center disc is punched out and drops through the die and into a scrap-box.

All that actually remains is to shave the sides of the teeth, which is done at station five, and to sever the teeth from the strip. Initially, the small slivers of metal removed during shaving gave trouble in the form of scratches on the plate faces, and in clogging of the die. This trouble has been largely overcome by spraying a mixture of soluble oil and water at the shaving station, as

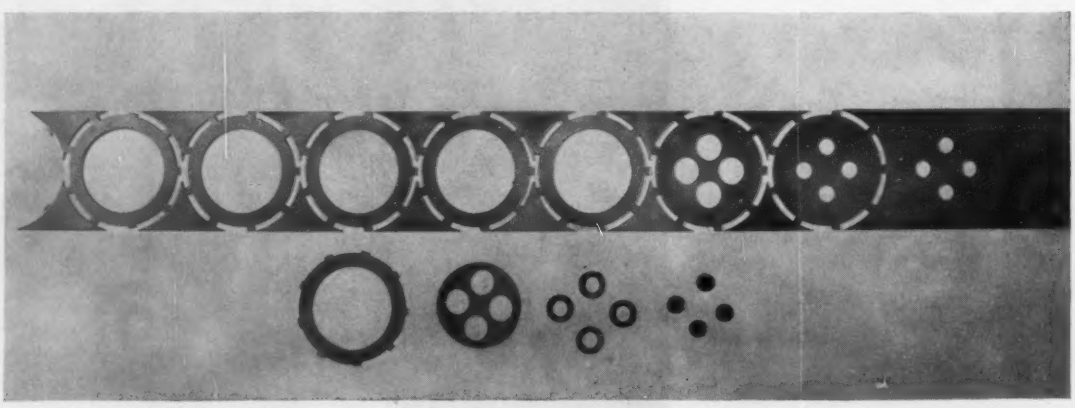


Fig. 1. Close spacing and use of the narrowest possible strip stock results in high metal economy during the stamping of clutch plates (lower left) in a nine-stage progressive die.

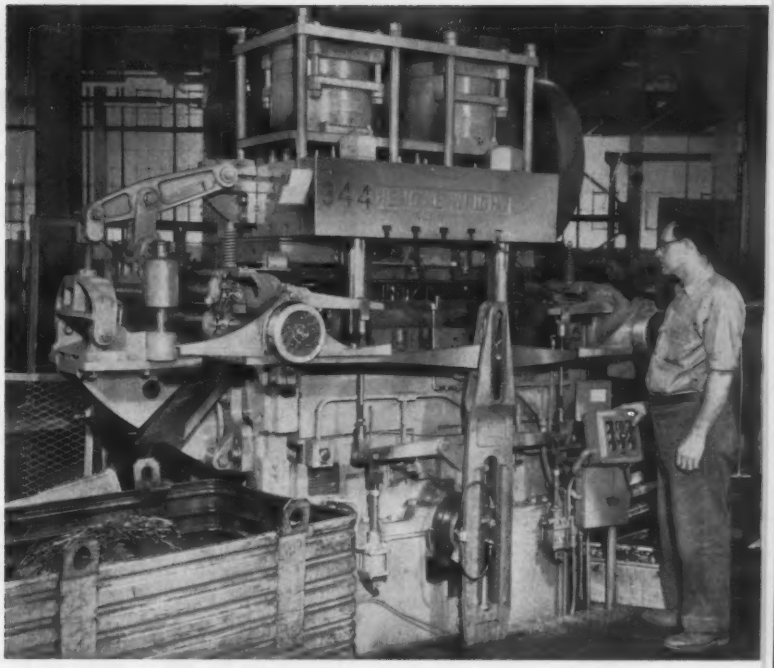


Fig. 2. Nine-stage progressive die mounted in a 20-ton dieing press. Entire operation, including stock leveling and feeding, is automatic, with a resulting production rate of sixty clutch plates per minute.

the solution effectively washes the metal fragments away from the die.

Stations six and seven are idle, but at station eight the ends of the teeth that are not attached to the strip are sheared off. Finally, at station nine, the remaining tooth ends are sheared off and the finished part is pushed through the die, down a chute, and into a tote box. At the same time, two triangular pieces of waste fall free and travel down chutes into scrap-boxes.

Aside from the central disc, several slugs, and the chips cut from the teeth, the triangular pieces are the only scrap resulting from the entire operation. By looking at the illustrated strip it can be seen that the part spacing is as close as possible, and that the strip is the narrowest that could be used, as some notches cut between the teeth open beyond the strip edges. Moreover, one tooth on each clutch plate is sheared in the space between the teeth of the following part.

These provisions indicate a high degree of material economy. Because the set-up requires the attendance of only one man, and because a production rate of sixty plates each minute is maintained, the cost per piece for labor is low.

* * *

According to a bulletin issued by the Council for Technological Advancement, Chicago, Ill., automation will create, save, and revive more companies, industries, and jobs than it will ever destroy.

Standard Industrial Engineering Terminology

Publication of the ASME standard on "Industrial Engineering Terminology" was announced by L. E. Newman, chairman of the Society's Management Division during a recent meeting of The American Society of Mechanical Engineers. This fifty-page booklet contains 500 industrial engineering terms arranged in alphabetical order, running from the initial entry, "Abnormal Reading," to the final entry, "Written Standard Practice." Definitions are brief and can be understood by non-experts in the field. The subjects considered range from elementary to complex production terms.

Typical definitions in the booklet of interest to the metal-working industry are:

"Downtime: *n.* A period of time that is usually equal to or greater than a specified minimum during which an operation is halted due to a lack of materials, a machinery breakdown, or the like.

"Fixture: *n.* A device which: 1. Holds material in a desired position but does not guide the machine or tools performing the necessary operations; or 2. Holds two or more parts in prescribed positions relative to each other while the parts are being assembled and/or joined together.

"Machine-Hour: A unit for measuring the availability or utilization of machines. It is equivalent to one machine working for 60 minutes, two machines working for 30 minutes, or an equivalent combination of machines and working time."

Internal Bead Eliminated by New Tube Welding Process

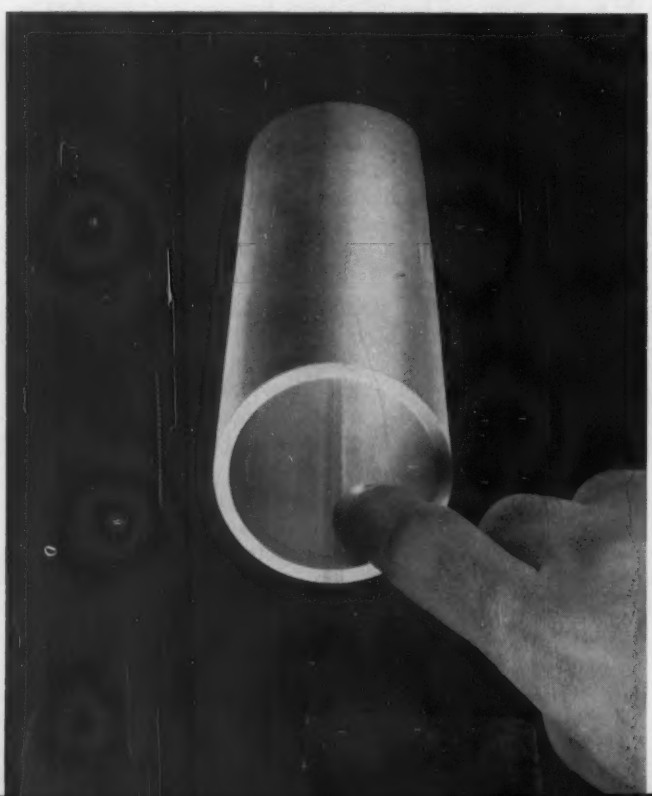
WELDED stainless and high-alloy steel tubing and pipe is now being manufactured by a new method known as "Trentweld." This welding process, which has been developed and patented by Trent Tube Co., East Troy, Wis., subsidiary of Crucible Steel Co. of America, imparts improved physical properties, appearance and corrosion resistance to the tubing.

The continuous mill used in forming the steel tubing consists of a series of horizontal and vertical rolls. Strip steel passes between the forming rolls where it is gradually shaped from a flat to a circular cross-section. This cold forming into a tubular shape magnifies any surface imperfections that might have escaped previous inspections. Any such flaws can be easily detected during forming because both sides of the material are exposed to scrutiny.

Inert-gas shielded-arc welding is employed to close the seam along the formed tubing. No filler metal is required, the weld being formed by complete fusion of the abutting edges of the work. As a result, the weld is of the same composition as the parent metal and is free from inclusions, oxides, and similar defects.

Unlike the welding set-up previously used, in which the seam was welded while located on the upper side of the tubing, the new method requires that the work be inverted, and that welding take place on the lower side. In this way, due to the force of gravity pulling the molten metal down, no bead is formed on the inner surface of the tubing after welding. Also, the weld bead on the outer surface of the tubing can be held both uniform in size and smooth so that a surface finish similar to that of the parent metal can be obtained. It is possible, therefore, to reduce the weld bead by swaging, and improve the mechanical properties of the tubing without undesirable side effects. Corrosion resistance has been improved due to the absence of internal valleys or grooves that might entrap corrodents.

Development of this process has enabled the company to produce welded tubing and pipe in many alloys that have not previously been used for this purpose. These metals include zirconium, Zircoloy, titanium, 19-9-DL, and various grades of Hastelloy. Both thin- and thick-wall tubing and pipe can be produced to a high finished quality.



Absence of internal bead in welded steel tubing and pipe is an achievement of the "Trentweld" process. Corrosion resistance of the tubing is increased.

INGENIOUS *Mechanisms*

Mechanisms selected by experienced machine designers as typical examples applicable in the construction of automatic machines and other devices

Differential Screw Assembly for a Slide

By PAUL GRODZINSKI, London, England

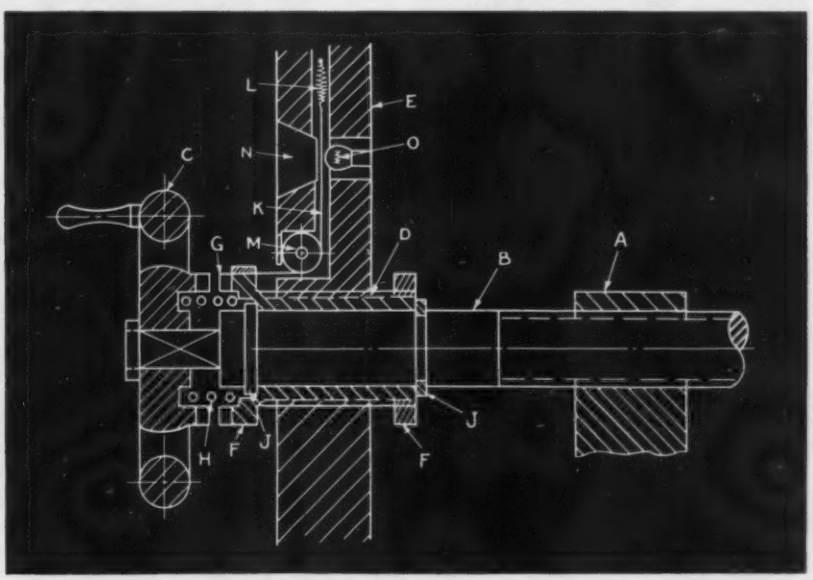
To enable a slide to travel at a reduced rate during part of its movement, a mechanism consisting of a differential screw assembly was designed. The device, shown in the accompanying illustration, controls the linear movement of a nut block *A* to which the slide is fastened. The nut block has a 10-pitch internal thread and engages the externally threaded end of a drive-shaft *B*.

At its opposite end, the drive-shaft is square in section, providing a sliding fit for the handwheel *C* which operates the slide. Part of the cylindrical length of the drive-shaft bears in a bushing *D*, which in turn, has a 12-pitch external thread engaging a fixed bracket *E*. Shoulders *F* on the bushing serve to limit its axial movement in the bracket. In addition, the left-hand shoulder is designed as a straight-tooth clutch *G*, the other member of which is developed from the hub end of the handwheel. A spring *H* keeps the two members of the clutch in normal disengagement.

Since another pair of shoulders *J*, fixed on the drive-shaft, prevents its axial movement, turning the handwheel produces a transverse travel of the nut block. When the clutch is disengaged, the bushing remains stationary while the drive-shaft rotates, and the nut block travels 1/10 inch per revolution.

To produce the speed differential, the clutch is engaged, and the bushing, now rotating in unison with the drive-shaft, also moves axially. This axial movement of the bushing is transmitted to the drive-shaft through the thrust against the shoulders *J*. Movement of the bushing and drive-shaft is opposite to the direction of the nut block. But since the bushing and drive-shaft move only 1/12 inch per revolution, the net result is to reduce the travel of the nut block to 1/60 inch $(1/10 - 1/12 = 1/60)$ per revolution.

Still finer adjustment of the slide is possible if the difference between the thread pitches is still smaller. Thus, with a 9-pitch nut block and a 10-pitch bushing, the travel of the nut block is only 1/90 inch per revolution. When equipped with a graduated collar, the handwheel will register the



When clutch G is engaged, the rate of travel of the slide is equal to the difference between the pitches of the two threads.

amount of slide travel through any small degree of drive-shaft rotation. For example, if the collar has 110 divisions, controlled fine adjustments of 0.0001 inch can be made.

Difficulties may arise if the bushing is rotated continuously in one direction, since eventually, one of the shoulders *F* will jam against the bracket. For this reason, a simple indicating device consisting of a transparent band *K* has been provided. One end of the band is fixed to the shoulder; the other is held by a spring *L*. The band is guided around a roller *M* in front of a window *N* in the bracket which is illuminated by an electric bulb *O*.

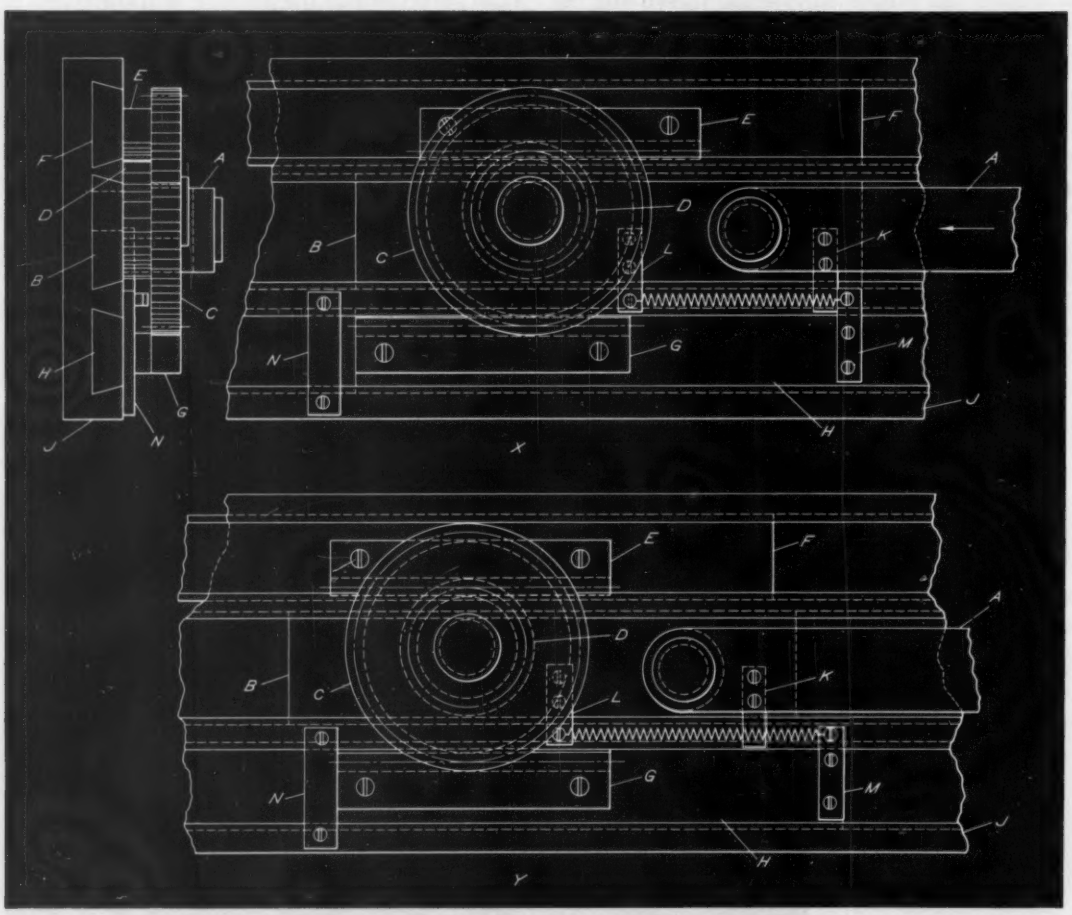
If the shoulders of the bushing come too close to the bracket, red-colored portions appear in the window as a warning. Another method is to fit micro switches or electrical contacts to the shoulders, which can close a circuit to a warning light. Either method will serve to expand the use of differential screws, since an important drawback to their operation is thus eliminated.

Mechanism for Effecting a Varying Reciprocating Motion

By L. KASPER, Philadelphia, Pa.

On a wire-forming machine, a reciprocating slide was required to move at a uniform rate of speed during part of the cycle and, at a predetermined point, to increase in speed for the remainder of the cycle. The motive power for operating this slide was taken from a uniformly reciprocating slide and then transformed into varying reciprocating motion by the mechanism here shown.

Rod *A* reciprocates at a uniform rate of speed and drives slide *B*. This slide carries gears *C* and *D* which are keyed together, yet rotate freely on a stud. Gear *D* meshes with the rack *E* which is fastened to a second slide *F*. The larger gear meshes with rack *G* on a third slide *H*. All three slides are dovetailed in the stationary slide bracket *J*.



Three-slide arrangement, utilizing gears in the capacity of a lever, varies motion supplied by a uniformly reciprocating source.

Dog *K* and spring retainer *L* are attached to slide *B* with screws, while spring retainer *M* is similarly secured to slide *H*. A stop *N* is fastened across lower dovetailed slot to slide bracket.

In operation the uniform reciprocation is obtained from rod *A* which moves slide *B* to the left as indicated by the arrow at X in the illustration. As long as contact between parts *M* and *K* is maintained by means of the tension spring, the central and lower slides will move in unison. There can be no rotative motion of the two gears at this point due to the fact that there is no change in the relative positions of slides *B* and *H*. Therefore the three slides will move harmoniously during this phase.

It will be noted at Y in the diagram that rack *G* has contacted stop *N*, thus preventing further movement of slide *H*. As slide *B* continues its movement, gear *C* is forced to rotate due to the relative movement between it and the now stationary rack *G*. Gear *D*, which rotates with the larger gear, transmits this motion to the upper slide through rack *E*. Slide *F* now moves at a greater speed than slide *B* as the gears are acting in the capacity of a lever with its fulcrum located on the pitch line of rack *G*. The ratio of gears *C* and *D* governs the extent of the increased speed of slide *F* as compared with that of slide *B*.

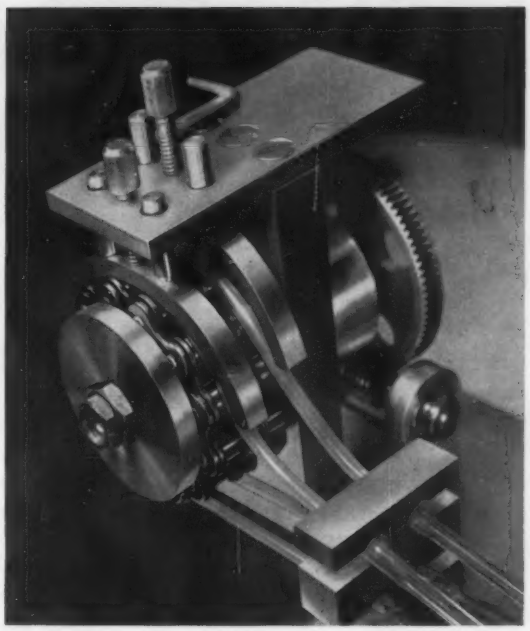
On the return stroke of rod *A*, the upper and central slides will move to the right in the same speed ratio with respect to each other as they did on the forward stroke. This will continue until dog *K* contacts spring retainer *M*, at which time all three slides will once again move in unison for the rest of the cycle.

Roller Chain Pumps Corrosive Fluid

By Worth M. Barton, Berkeley, Calif.

The "peristaltic push" of roller chain against flexible hose proved a practical means of pumping a highly corrosive cutting fluid required in machining special aluminum alloys. Available coolant pumps had to be abandoned, since none were both leakproof and corrosion resistant. In the accompanying illustration is shown the device which was constructed.

A drum, bearing centrally in a vertical bracket, at one end has a length of roller chain banded around its periphery. The chain used is a double-roller style, to obtain a flow of sufficient volume. Two plastic hoses which are impervious to the corrosive action of the fluid are routed around the chain, one over each roller line. One end of each hose extends to a spout at the cutting tool, and the other end to the cutting fluid reservoir.



When the drum revolves, the contraction of the hose by the rollers causes the fluid to flow.

Semicircular caps maintain a pressure contact between the chain and the hoses. These caps hang from a roof plate attached to the bracket. Alignment with the chain is maintained by dowel pins between the roof plate and the caps, and pressure is adjusted by knurled-head screws.

To revolve the drum, a worm-wheel is fixed to its other end. Power is obtained through a flexible shaft which is coupled to a worm engaging the wheel. Since the chain revolves with the drum, the hose sections under direct pressure from the caps are momentarily contracted by the passage of each of the rollers in the chain. The "peristaltic push" thus created causes the fluid to flow through the hoses.

The rate of flow through the hoses is controlled by regulating the cap pressure. Maintenance is minimized, the hose being readily replaced when excessively worn or dirty.

* * *

Beryllium-copper strip is rolled to a thickness of 0.001 inch, with a tolerance of plus or minus 0.0001 inch, by the American Silver Co., Flushing, N. Y. The strip is an essential element of the ice-detection control system used in aircraft, forming a pressure-sensitive diaphragm. Minute variations in pressure on this strip are transmitted to electronic circuits which carry out the danger signals transmitted by the ultra-sensitive diaphragm.

TOOL ENGINEERING *Ideas*

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Two Bending Dies Complete Keystone Shape

By GEORGE WILSON, Mankato, Minn.

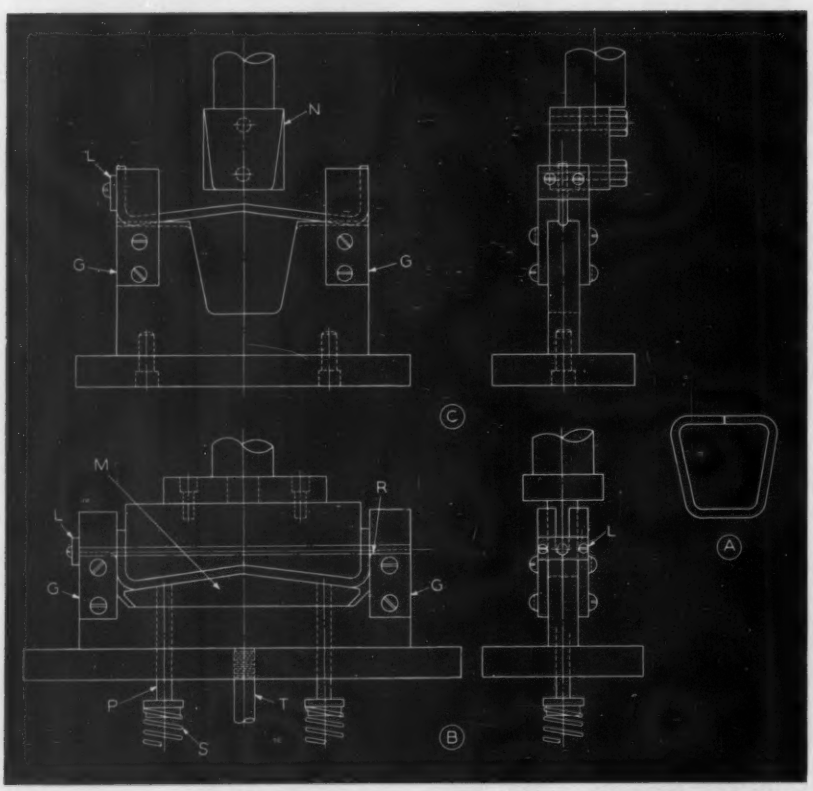
A pair of simple bending dies convert cut-off lengths of rod stock to a keystone shape. In the accompanying illustration, view A shows the shape obtained; and views B and C, the two dies which were designed.

The first die, view B, completes the two end bends and leaves a mild reverse bend in the middle of the rod. In its illustrated position, the die has reached the terminal point of the press down stroke. When loaded, the rod occupies the area indicated by the broken lines. It is supported in the grooved tops of guides *G* and located against a stop *L* fastened to one of the guides.

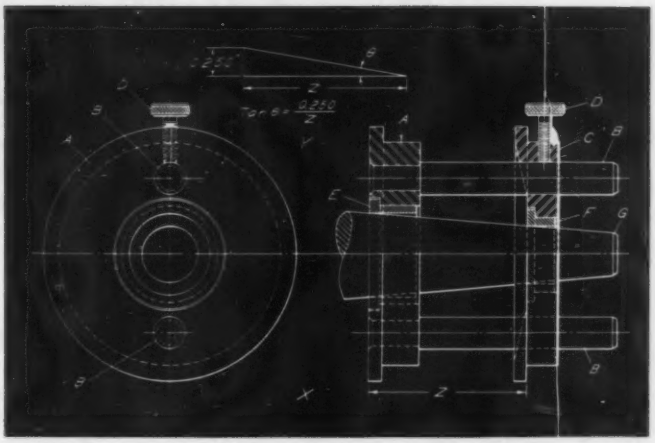
The guides serve to keep the ends of the rod parallel during bending. To assist the movement of the rod into the die, the inner end of each groove in the top of the guides blends into a radius *R*. The die is constructed with a movable baseplate *M* which serves as an ejector during the up stroke of the press. This movement is produced by the upward thrust of springs *S* against pins *P* beneath the baseplate. The springs rest on a yoke, not shown, carried on a stud *T*.

In the second die, view C, the two inner bends, each 101 degrees, are made. As the part is drawn into the die, the ends wrap around the top of the punch *N*, thus forming the keystone shape. To permit this action, the punch is offset from its shank.

As in the first die, the part is supported in grooved guides *G* and located against a stop *L*.



A movable baseplate *M*, view B, and an offset punch *N*, view C, are features of the bending dies.



Adjustable taper gage with replaceable sleeves can be applied to an extensive range of tapers

The working surfaces of the punch correspond to the inside dimensions of the finished shape. After bending, the parts are stripped off the punch in a quick manual movement.

Adjustable Gage Checks Wide Range of Tapers

By W. M. HALLIDAY, Southport, England

A simple gage with which it is possible to check the angle of tapered plugs, dowel-pins, reamer blanks, and other such components may be seen at X in the accompanying illustration. The gage is readily adjustable to suit work-pieces in a wide range of sizes and tapers. Unless the tapered work-piece is being held between centers, it need not be removed from the machine to have the gage applied.

Member *A* is a steel ring on whose periphery a flange has been machined. The diameter of the flange is about 0.500 inch greater than that of the ring body. A 1.750-inch diameter hole is bored through the center of the ring. After counterboring this hole as shown, then drilling two holes for the reduced ends of guide rods *B*, the ring is case-hardened followed by grinding on the left-hand face and in the bore.

A second ring *C* has the same body and flange diameters as the left-hand ring, but is narrower. Also, the bore is only 1.250-inch diameter. A dish-shaped recess is provided on the back face of the ring so that its base is in direct line with the shoulder face of the ring flange. Following the necessary drilling operations and heat-treatment, the bore and right-hand flange face are ground.

Alignment between the rings is maintained by means of the two guide rods *B*. The smaller diameter step at one end of each rod passes through ring *A* and is permanently secured by peening. Guide holes in ring *C* are carefully drilled from ring *A* to assure correct alignment. They should be reamed to a close sliding fit with the rods. The setting of the gage may be locked through the action of knurled lock-screw *D*.

Headed cast-steel sleeves *E* and *F* are pressed into the ring bores. The top face of sleeve *E* must be level with the ground face of ring *A*, and its bore ground to exactly 1.500 inches diameter. Similarly, the top face of sleeve *F* must be level with the base of the dish-shaped recess in ring *C*, and its bore ground to 1.000-inch diameter.

Shaft *G*, whose sides are tapered to an included angle of 10 degrees (5 degrees side angle), may be used to illustrate the operation of the gage. First, ring *C* is backed off and the shaft fitted within sleeve *E*. Then, the movable ring is brought back until it also fits snugly over the shaft. Lock-screw *D* should be tightened to lock the setting. A micrometer reading is now taken to determine dimension *Z*. Having found this dimension, the side taper angle of the shaft may be determined by simple trigonometry as shown at Y.

The 0.250 dimension in the illustration represents half the difference between the 1.500-inch diameter bore of sleeve *E* and the 1.000-inch diameter bore of sleeve *F*. The desired side angle is represented by θ. In this particular caze Z is found to be 2.857 inches. Therefore:

$$\text{Tan } \theta = \frac{0.250}{2.857}$$
$$= 0.0875$$
$$\theta = 5 \text{ degrees}$$

As constructed, this gage covers a considerable range of work sizes. However, to enlarge its usefulness, the sleeves shown may be replaced with sleeves of various bore diameters to suit the work at hand.

Fixture Facilitates Grinding of Spherical Radii

By SAMUEL ROSEN, Lorain, Ohio

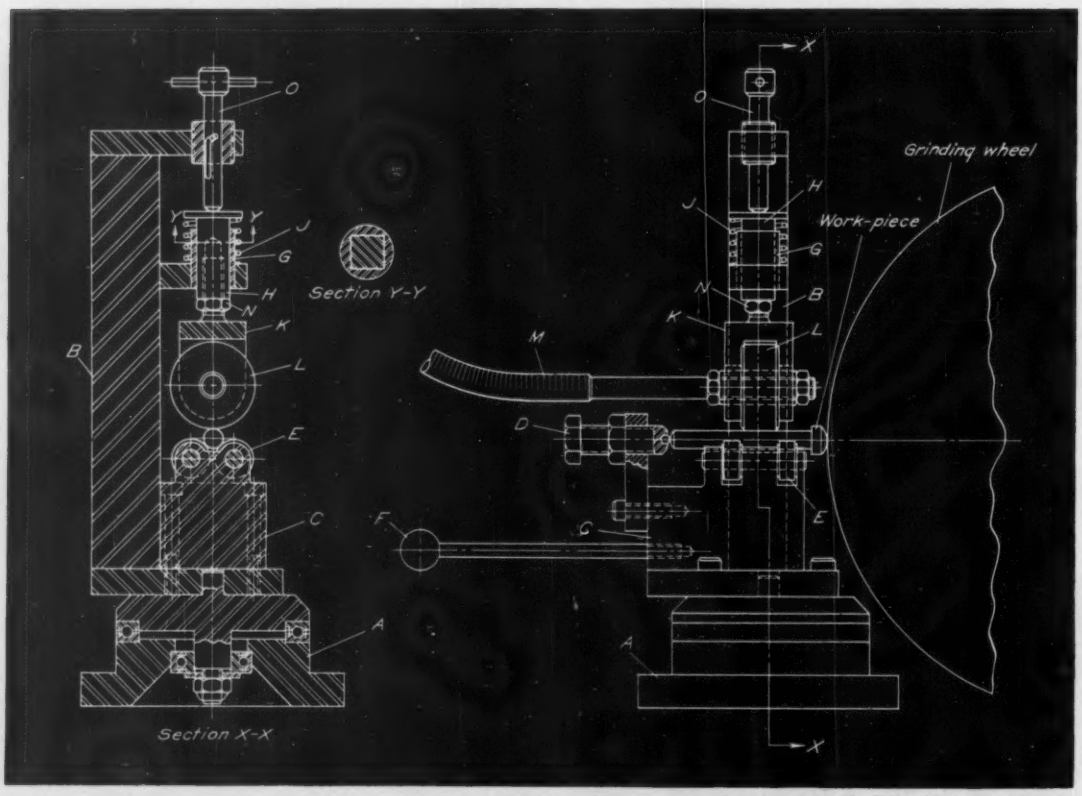
A spherical radius, to be machined on the end of a headed component, was required to be held to close limits of concentricity with its shank. To accomplish this, the illustrated fixture was designed. This fixture rotates the part and, at the same time, permits it to be pivoted while maintained at the desired radius setting.

Base *A* is of the turntable type, having a centrally located pin projecting upward from its top surface. Located on this pin, and screwed to the turntable, is a weldment *B* that serves as the frame for the fixture. Secured to the lower weldment member by cap-screws is a support block *C*. On this support block are mounted three other components of the fixture; an adjustable ball-end work stop *D* for maintaining proper radius setting, a group of four sealed ball bearings *E* for supporting the work-piece, and a handle *F* for swiveling the fixture.

A bushing *G*, through which a square hole has been broached (section Y-Y), is pressed into a horizontal support projecting from the main frame member. Square push-rod *H* rides within this hole. The push-rod is provided with a thin head at its upper end to retain compression spring *J*, and a hole tapped longitudinally in its lower end to receive the threaded shank of forked bracket *K*.

A hard rubber driving wheel *L*, which itself is driven through flexible shaft *M* by an electric motor, is supported by bracket *K*. This rubber wheel is offset at a slight angle, in a horizontal plane, so as to continually force the work-piece against work stop *D*. Adjustment of this angle is permitted by means of the threaded shank of the forked bracket together with lock-nut *N*.

The entire fixture assembly is mounted on the table of a standard cylindrical grinding machine. A work-piece is cradled between the ball bearings on the support block and banked against the ball end of the work stop as shown. Quick-acting clamp *O* is depressed, forcing the push-rod and driving wheel down, against spring pressure, until the rotating wheel contacts the work-piece shank. With the work-piece being thus forced to rotate, the spherical radius may be generated by swiveling the fixture with handle *F*. The reciprocating table movement of the grinding machine should be engaged.



Fixture rotates work-piece and also provides pivoting motion to simplify accurate grinding of spherical radii.

Talking With Sales Managers

By BERNARD LESTER
Management Consulting Engineer

Selecting Sales Engineering Personnel

SALES managers recognize the importance of selecting and training young men to provide for replacement and growth in their organizations. Hence, in view of the continuing shortage of technically trained men, the time is ripe to revaluate selection methods by applying a realistic attitude and policy. Don't put off the job until spring.

There are three fairly well defined sources of personnel to ultimately fit into various functional activities of the sales department. (a) Graduates of colleges to serve as cadets. (b) Technically trained men outside the company who are misplaced or dissatisfied. (c) Men within other departments of the company, whose potential qualities and ambitions lean toward sales. Let us consider each one:

Graduates—Introducing talent at the bottom permits a training in policies, equipment, and methods. Loyalty and a feeling of "belonging" can be inculcated. The individual can be studied —his aptitudes, tastes, and desires—with a view toward a happy "marriage" between man and company.

Don't limit research for talent to the engineering colleges. Industrial management is broadening its vision regarding the selection of university graduates. More and more attention is being given to the characteristics and potentials of the man, rather than his specialized training. Graduates of the arts and business colleges, if well grounded in mathematics and the physical sciences, often succeed remarkably well when given the opportunity to learn the more practical phases of an engineering business.

Directing written inquiries to a number of colleges, brings slender response these days because of the keen competition for graduates. Establish a permanent and personal contact with just a few colleges. Honestly interpret to them your company policies and practices as well as achievement opportunities. The tie to an educational institution must go beyond an offer for employment and should be an opportunity for service.

Summer employment for college teachers and students; furnishing technical literature and instructional material, or an occasional lecturer; scholarship help; and inspection trips for students, are examples of services that yield a close bond between a college and the company. Many companies appoint a graduate within its ranks as a liaison man to develop relations with a college.

Outside Men—Since college graduates are frequently enthused by alluring inducements offered by a recruitment officer, disappointments often occur. To add to the confusion is time out for military service and the problem of relocation. Both conditions contribute just now to an unusually large proportion of graduates who are unsettled and may seek relocation.

How to locate such men, without following the questionable practice of raiding another employer is a problem. Useful channels for contact are the employment services, furnished gratis to members, of numerous technical and business societies. Well-placed advertisements in technical and industrial journals have brought man and company together.

Men from Within—"The right man in the right place" is a sound rule for an industrial equipment company to follow. The partitions between design, manufacture, and sales are not as pronounced as they used to be. A man originally selected for sales engineering, due to his inclinations and aptitudes, may prove to be better suited for other work.

If the sales manager adopts a policy of "give and take," he will often find that within the ranks of other departments there are men who will succeed better as field or home office sales application engineers, market analysts, or in sales promotion, rather than in their present jobs. It pays to discuss with other department heads within the company the possible interchange of men.

No responsibility of the sales manager is more important than that of planning well ahead to tap every possible source of future manpower.

LATEST DEVELOPMENTS IN *Shop*

Fig. 1. Cross special dial type machine for processing intake manifolds

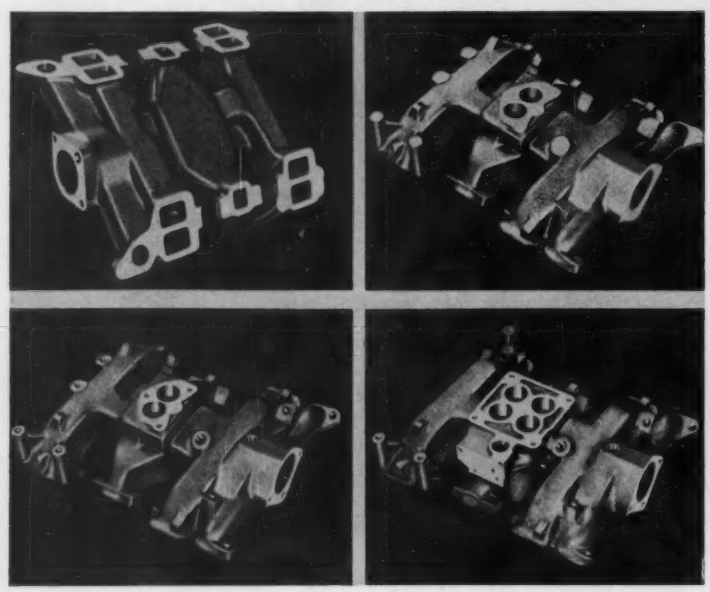


Fig. 2. Two- and four-barrel intake manifolds processed on machines shown in Figs. 1 and 3

Cross Transfer-matic and Dial Type Machines for Automotive Parts

The Cross Company, Detroit, Mich., has developed two new machines for automation processing of two- and four-barrel intake manifolds. The first machine, a Cross special dial type, shown in Fig. 1, rough- and finish-mills the mounting faces; and mills, drills, and chamfers the water outlet pads of manifolds like the ones shown in Fig. 2. The second machine, a Transfer-matic, shown in Fig. 3, rough- and finish-mills the carburetor pad and mills the choke pad on the four-barrel manifold seen in the lower right-hand corner of Fig. 2. It also bores the port holes, drills and chamfers all other holes except three in the water outlet pad, and taps all holes.

The dial type machine, Fig. 1, handles 145 pieces per hour, using seven stations—one loading, four milling, one drilling, and one chamfering. It utilizes hydraulic-power clamping for the work-holding fixtures, automatic retraction for the milling cutters, gravity-operated cam clamping for the indexing table and pre-set tools designed to reduce down time.

The Transfer-matic, Fig. 3, processes 140 manifolds per hour. It has thirteen stations—one loading, eleven working, and one unloading. A unique feature is the push-button change-over control designed to facilitate shifting from the production of two-barrel to four-barrel manifolds.

The parts are initially located from the port openings. The transfer mechanism for moving the

Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON

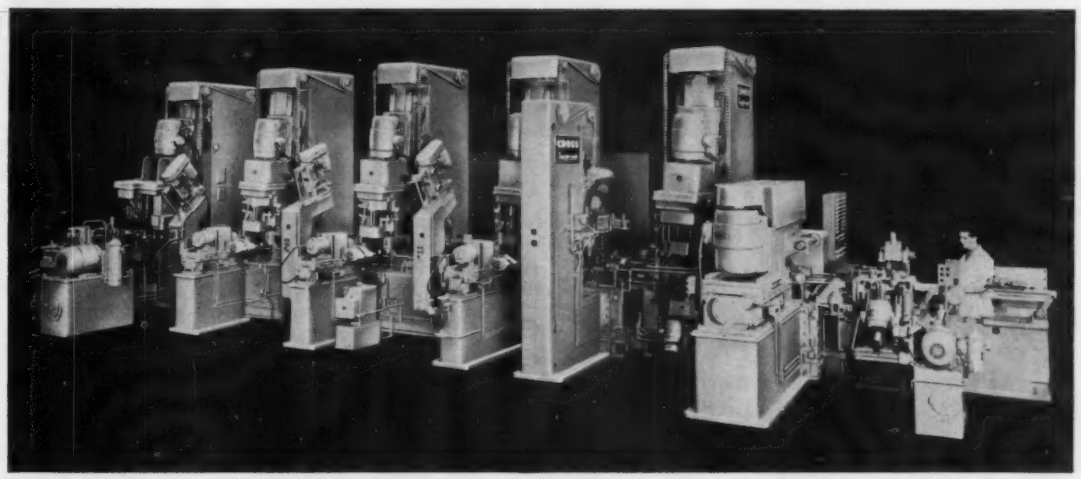


Fig. 3. Cross Transfer-matic equipped for milling operations on automotive parts shown in Fig. 2

parts between stations is of the lift-and-carry type. Pre-set tools are used with the Cross machine control unit to reduce down time for tool changing. Both machines feature hardened and ground ways and complete interchangeability of all standard and special parts. This provides for easy maintenance and construction to J. I. C. standards.

The dial type machine, Fig. 4, is another special Cross machine developed recently for the drilling, chamfering, and tapping of tractor wheels like the one shown in the lower right-hand corner of the illustration. This new machine has a power-operated index-table with four stations—one for loading, one for drilling, one for chamfering, and one for tapping six holes on two sides of the wheel. Production on this machine is 54.5 pieces per hour at 100 per cent efficiency. A fluid-motor drive is provided for indexing the dial of this machine. The automatic unit also has individual lead-screw feed for tapping and gravity-operated cam clamping for work-holding fixtures.

Circle Item 101 on postcard, page 243

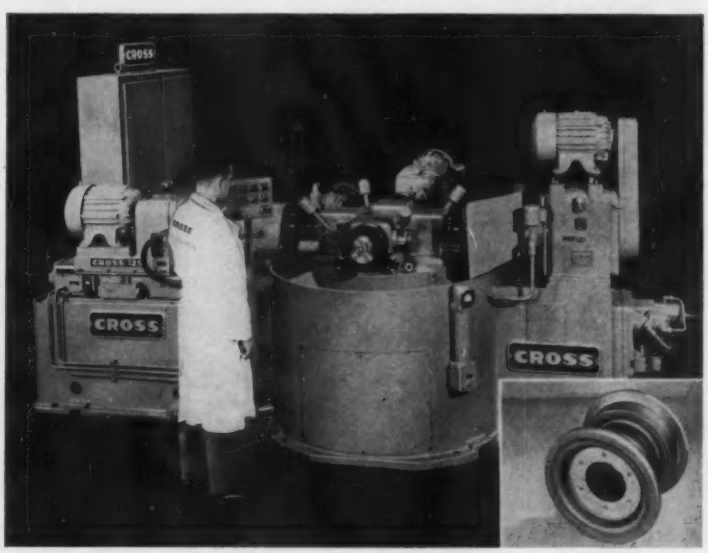


Fig. 4. Dial type machine developed for drilling, chamfering, and tapping tractor wheels

"Jigmatic" Electronic Digital Positioning Table

Arter Grinding Machine Co., Worcester, Mass., has brought out a "Jigmatic" tape-controlled, electronic digital positioning table. This device automatically positions work-pieces under, or in front of, a drill, tap, boring-bar, or similar tool. It eliminates the necessity of making jigs, special measuring rods, or accurate adjustable screw rods, as the accuracy of hole spacing is contained in the tape. On a given size table several hundred holes can be drilled in the work, the limiting factor being only the length of tape that can be handled on reels. The table can be moved in increments of 0.001 inch.

The illustrated unit has a work-table positioning capacity of 20 by 30 inches. It has a base and two slides that are situated at 90 degrees to each other. Although both slides move simultaneously, each is independently driven by a 1-H.P. motor. Maximum spacing time is fifteen seconds. The slides are automatically locked by means of an electromagnetic brake. Accuracy of positioning is 0.001 inch in 10 inches.

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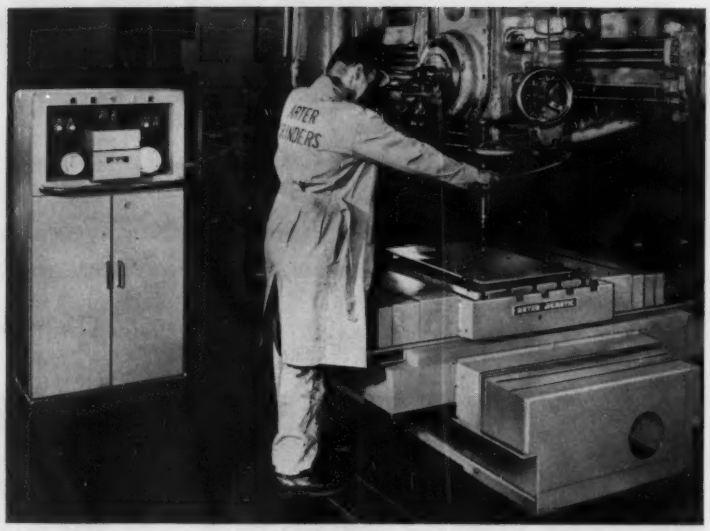


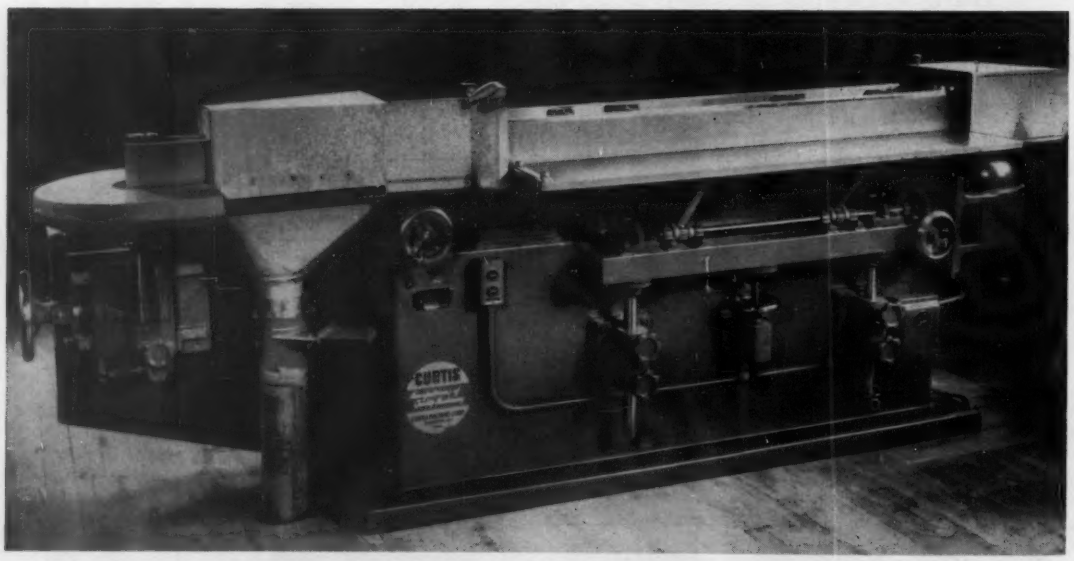
Arter "Jigmatic" tape-controlled, electronic digital positioning table

Platen Grinder with Abrasive Belt Driven and Backed Up by Serrated Belt

A platen grinder with a serrated contact belt 4 inches wide by 175 inches long which drives and backs up an abrasive belt having a length of 226 inches, has been developed by the Curtis Machine Corporation, Jamestown, N. Y., in cooperation with the Carborundum Company, Niagara Falls, N. Y. This machine, called the "Curtis 91," employs a unique arrangement of the serrated contact belt and a serrated contact roll for grinding and polishing work with flat or radius surfaces.

The contact belt and roll cannot be seen in the illustration, their diagonal serrations being covered by the abrasive belt. The abrasive belt passes over the serrated pulley at the left-hand end of the machine where it is put to use for polishing radius-formed surfaces.

The exposed abrasive belt surface used for flat surfacing may be seen at the rear of the long horizontal work-table. At this point the abrasive belt is backed up and driven by the moving serrated contact belt. With this ar-



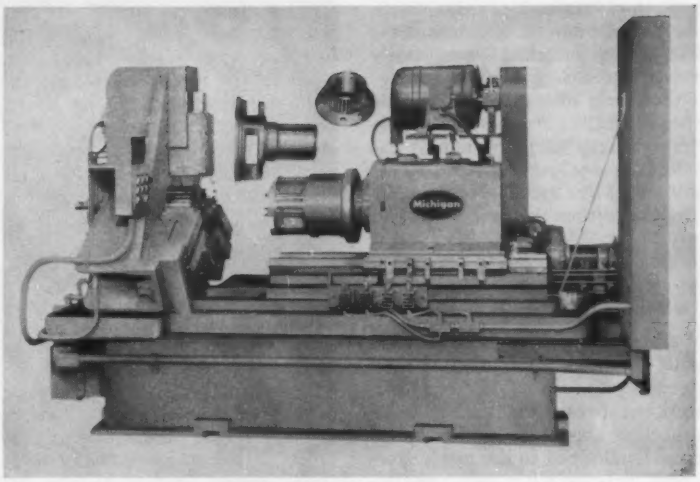
Curtis platen type grinder with abrasive belt driven and backed up by a serrated contact belt

rangement the abrasive belt does not come in contact with the stationary platen as in previous machines. Thus it is subject to much less frictional heat and, as a result, loading and glazing are minimized and the life of the abrasive belt is greatly lengthened.

Available belt widths range from 4 to 8 inches. The machine shown has three working tables or stations, one on each side for flat work and one at the end for radius-formed parts. The tables are adjustable for angle grinding and permit three men to work simultaneously on different parts.

The serrations on the contact belt are said to flex the coated abrasive belt so that a fast cutting action is set up, greater chip clearance provided, and clean, cool cutting efficiency obtained. Since the serrated belt absorbs the friction against the steel platen, it leaves the abrasive belt free to do its work and permits belts with finer abrasive grits to be used without danger of burning the work.

Circle Item 103 on postcard, page 242



Gun-drilling machine built by the Michigan Drill Head Co.

Gun-Drilling Machine

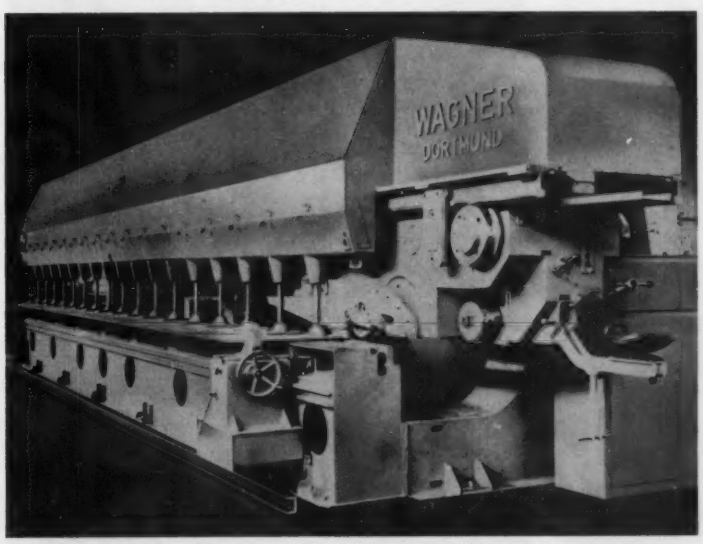
The Michigan Drill Head Co., Detroit, Mich., has built a high-production type, gun-drilling machine designed to save time and manpower while still maintaining the extreme accuracy required. The machine is equipped to drill six holes in a carrier gear within the size limit range of 0.5102 to 0.5107 inch in diameter, and to maintain hole-location accuracy within 0.001 inch.

Production is at the rate of 400 completely finished parts in an eight-hour shift whereas the drilling and reaming process previously employed produced only 75 parts per shift. This machine also has the advantage of being built to handle three totally different parts. The diameter of the largest part it will handle is 12 inches and of the smallest part, 6 inches.

Circle Item 104 on postcard, page 243

Wagner Roller Shear with Planing Attachment

The Kurt Orban Co., Inc., Jersey City, N. J., recently exhibited a new Wagner roller shear with planing attachment at the Hanover Fair held in Germany. This Model SRRh 14/8 machine will cut plate material up to 26 feet in length and up to 0.551 inch in thickness. The machine is also available with a maximum cutting length capacity of 49 feet for plates up to one inch in thickness. Plates with a maximum thickness of two inches can be handled by the planing attachment which permits machining of the plate edges for any type of welding operation desired.



Wagner roller shear with planing attachment which has been announced by the Kurt Orban Co., Inc.

The upper knife carriage holds two circular knives, adjustable axially and radially. One of these is used for straight cuts, the other one for beveled cuts. The bevel cut knife can be exchanged quickly for other knives so that the plate edges can be prepared for butt- or bevel-welding.

The planing attachment also works in both directions. It is held in a swiveling tool-head which is adjustable within a wide range, both horizontally and vertically. When cutting with the circular shear, the knife carriage is controlled from a push-button panel at the end of the holding beam. When planing, the controls for driving, feeding, and reversing the planing tool are actuated from the shear table. For added conveni-

ence, the operator rides along with the shear table on a comfortable seat, from which he can easily watch the cutting action.

Clamping of the plate is done pneumatically. Push-button panels, arranged on both ends of the holding beam, permit selective actuation of the solenoids in such a way that either the first or the last clamping element in the line is actuated first. This facilitates aligning the plate. After thus aligning the plate, the remaining clamping elements can be added continuously in groups, so that possible waviness in the plate can be smoothed out during clamping to a great extent.

Circle Item 105 on postcard, page 243

H-P-M Giant Size Presses

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has recently built two exceptionally large presses. The heavy-duty metal-working press with a 3000-ton capacity, shown in Fig. 1, was recently shipped to the new Caterpillar Tractor Co.'s plant at Decatur, Ill. This gigantic hydraulic press will be used for a wide variety of heavy blanking and metal-forming operations. It has a 1000-ton die cushion and a pressing area 96 inches by 96 inches. Die-cushion platen dimensions are 76 inches by 65 inches and the die-cushion stroke is 18 inches. The weight of the entire unit is 574,800 pounds.

The towering H-P-M hydraulic reinforced plastics press shown in Fig. 2 is said to be the largest press for molding reinforced plastics ever constructed. It was designed and built by the Hydraulic Press Mfg. Co. for Zenith Aircraft, Division of Zenith Plastics Co., Gardena, Calif., for use in making reinforced plastic parts.

With a total height of 63 feet, 7 inches, the press stands 38 feet, 7 inches above the floor and its foundation goes down 25 feet. It has a press capacity of 600 tons and a total weight of 307,000 pounds. The platen is 75 by 104 inches. Daylight capacity is 27 feet and the press stroke 17 feet.

Circle Item 106 on postcard, page 243

"Easyarc" Electrode

The "Easyarc" LH 7-16 electrode, recently announced by the Air Reduction Sales Co., Division of Air Reduction Co., Inc., New York City, is said to be capable of depositing metal at an exceptionally fast rate. The three factors making this high welding speed possible are: concentrated arc energy; powdered-iron coating which melts and becomes part of the weld; and extra-heavy coating that helps control arc action and which allows higher currents to be used with complete safety. Welds made with this new electrode are claimed to have excellent stretch and toughness characteristics.

Circle Item 107 on postcard, page 243

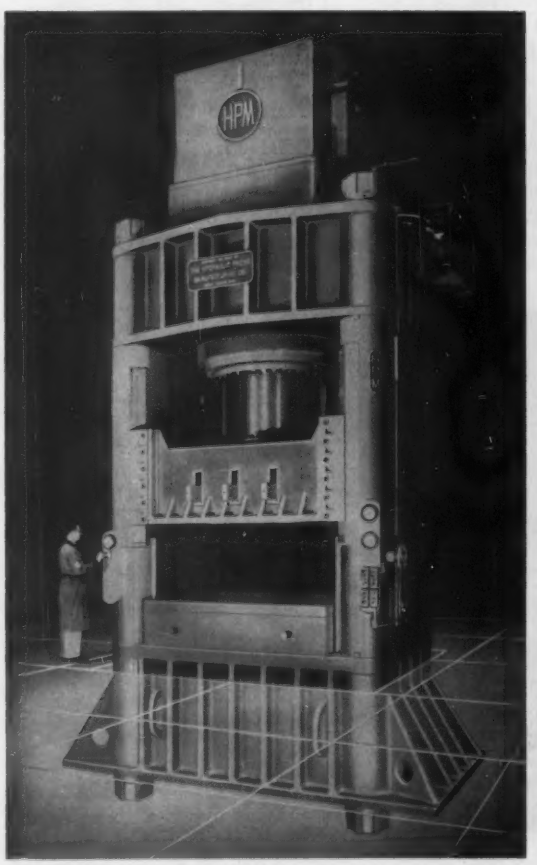


Fig. 1. Giant size H-P-M metal-working press

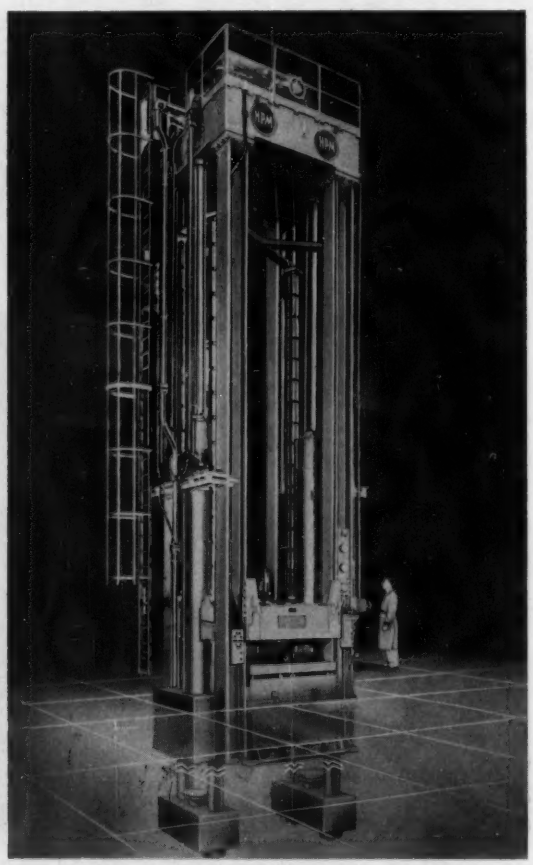
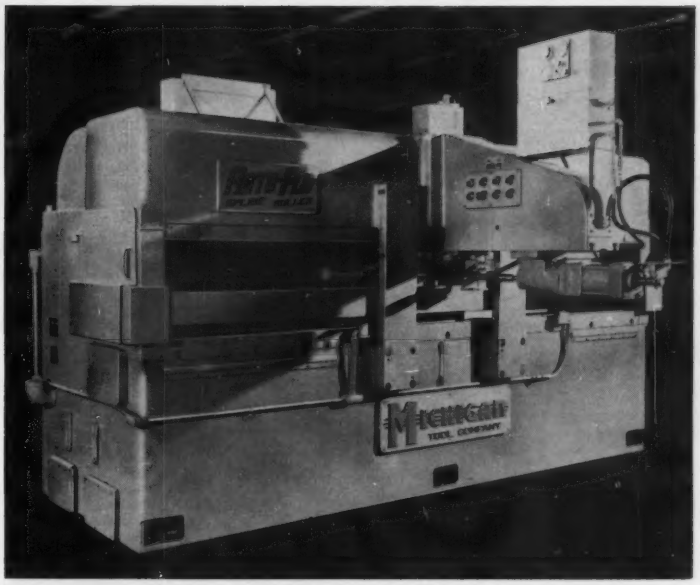


Fig. 2. Huge H-P-M reinforced plastics press



Spline-rolling machine of increased capacity which has been added to the "Roto-Flo" line of the Michigan Tool Co.

"Roto-Flo" Spline-Rolling Machine

A Model 1551 "Roto-Flo" spline-rolling machine capable of cold-forming splines and other shapes up to 2 inches in diameter is announced by the Michigan Tool Co., Detroit, Mich. This is the third machine in the "Roto-Flo" line that now spans a work-diameter range of 1/2 inch to 2 inches, with face widths up to 4 1/2 inches. Earlier machines of this line are being used for forming straight, tapered and helical splines; serrations; and oil grooves.

Like the original Model 1525 and 1537 machines, the new 1551 Model forms toothed and grooved shapes on shafts by rolling the piece between two parallel-acting racks. It will handle parts ranging in lengths from 12 to 36 inches, requires a floor space 135 by 105 inches, has an over-all height of 80 1/4 inches, and is driven by a 25-H.P. motor.

Circle Item 108 on postcard, page 243

Haskins Turbine Type Air Grinder

The R. G. Haskins Co., Chicago, Ill., has added a turbine type air grinder, called the "haskAIR GRINDER," to its line of shaft equipment. The new grinder weighs 18 ounces, measures 5 3/4 inches in length and develops 1/5 H.P. at 75,000 R.P.M. Special features include: permanently sealed bearings which eliminate the need for lubrication in air lines or the grinder itself; removable nose piece for extra-deep grinding; and lightweight, hand-fitting aluminum housing that enables pencil-like control for the most precise grinding job. The Gyro action of the turbine is said to facilitate steady holding of the tool.

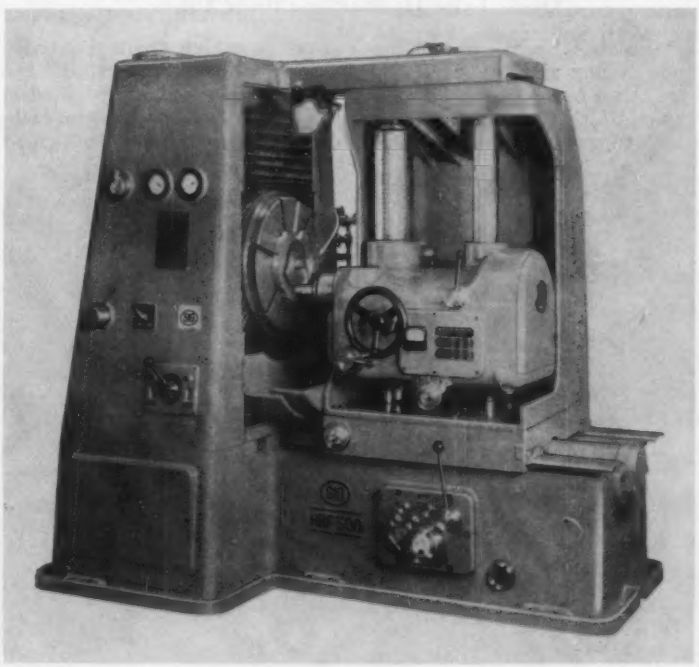
This grinder is offered in a complete kit unit containing the grinder, carrying case, adapter hose, mounted points, dressing stone, and wrenches. A complete line of accessories, including mounted points, cutters, files, tool-post holder, air filter and air-pressure regulator, is available for handling a wide range of work.

Circle Item 109 on postcard, page 243

"Sig" Cam-Milling Machine

Morey Machinery Co., Inc., New York City, is introducing in this country the "Sig" cam-milling machine here illustrated. This machine is built in Switzerland and is designed for milling all kinds of cams and for machining irregularly shaped work-pieces. It is rigidly constructed to insure high cutting capacity and accuracy combined with good finish.

The hydraulically operated copying device is designed to permit exceptional accuracy in the duplication of cams from a sheet-steel template. The milling spindle of



"Sig" cam-milling machine which has been introduced in this country by Morey Machinery Co., Inc.

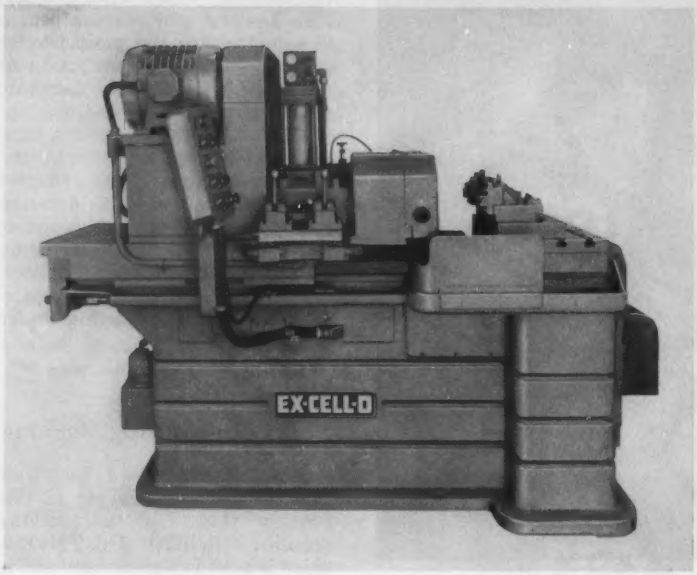


Fig. 1. Ex-Cell-O cam-operated precision boring machine for rapid generating of accurate contours

the machine can be replaced by a planetary grinding attachment for finishing hardened cams such as used on many automatic machines. Inexpensive sheet-metal templates can be used for accurate duplication work and carbide cutters can be employed to produce accurately milled surfaces.

Circle Item 110 on postcard, page 243

Ex-Cell-O Cam-Operated Boring Machines and Quill Type Hydraulic Power Units

The Style 312 cam-operated precision boring machine shown in Fig. 1 has been designed by the Ex-Cell-O Corporation, Detroit, Mich., to generate accurate contours on a high production basis. This machine is controlled by a pair of cams which are mounted on a single heavy shaft arranged to maintain positive coordination of mechanical movements. One cam controls the cross-slide while the other controls the table slide. The cams are opposed by air cylinders and engage the followers at the center of the slides so that their action is directly applied. This arrangement is said to eliminate the use of levers and to guarantee maximum accuracy. Both the table slide and the cross-slide have their own ways, which are widely spaced, hardened and ground, and are lubricated automatically.

A separate set of cams is required for each new form. Cam-changing is simple and fast, for the entire cam assembly swings out of the base and is readily accessible. Spindle assemblies, chucking equipment, drive motors and brakes are selected to suit the work and are also arranged for easy accessibility on the table.

The Ex-Cell-O quill type hydraulic power units shown in Fig. 2 were included among the new models introduced at the Machine Tool Show. These units provide the automatic cycles for production machines and are used for feeding and rotating cutting tools or driving multiple-spindle heads. They are especially suited to automatic drilling, reaming, counterboring and spot-facing. Step-drilling equipment will also be available for these units.

In step drilling the unit is cycled to drill to a predetermined depth, retract to allow coolant to flow to the drill point and clear the chips, then return in rapid traverse to approximately 1/16 inch of the previous drill depth. Drilling is continued automatically and the cycle is repeated until the hole is drilled to the desired depth. The depth of each drill step is controlled by an electric timer which is part of the machine's electric circuit. These step-drilling machines are recommended for use where the holes are too deep or too small to be drilled by other methods.

These highly versatile power units have a wide range of feed rates and are easily arranged for machining cycles. With the use of a plain base the units fill the need for simple, single purpose, high-production machines that can be easily adapted to new work. Several units are often used on a single base for multiple operations. Controls can be set for simultaneous or successive functioning.

Circle Item 111 on postcard, page 243

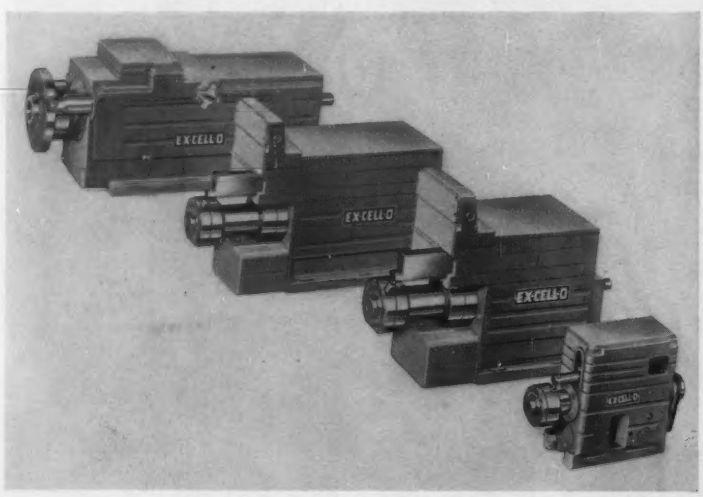
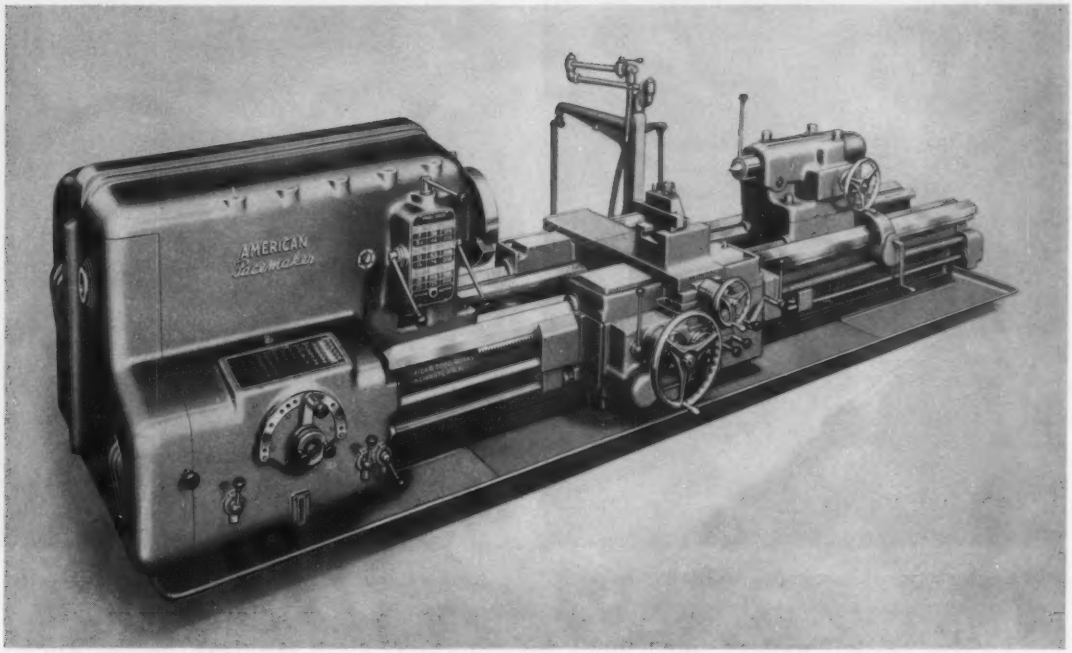


Fig. 2. Hydraulic power units built by Ex-Cell-O for automatic cycle control of production machines



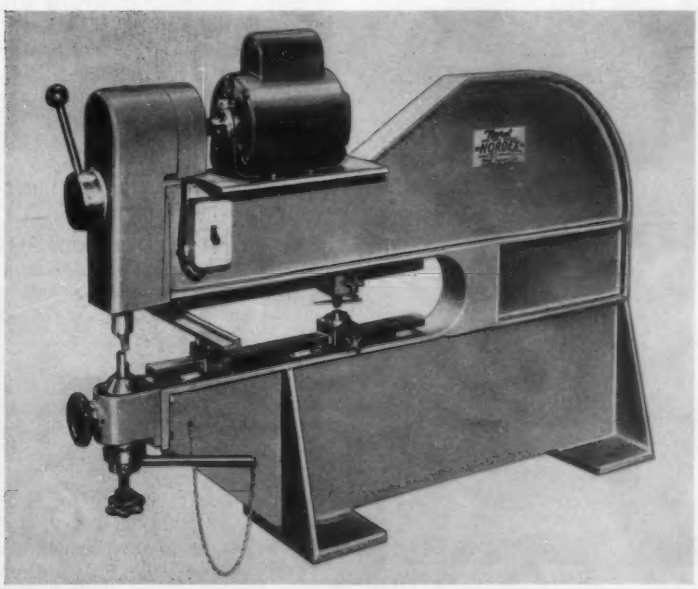
Intermediate size Pacemaker lathe announced by the American Tool Works Co.

Pacemaker Lathe Built in Intermediate Size

The line of "Pacemaker" lathes built by the American Tool Works Co., Cincinnati, Ohio, has been expanded by the addition of a new size designated as the 32-inch Style "H." This new lathe has been added to bridge the gap between the 25-inch and 32-inch heavy-duty sizes. It is designed to handle a sizable percentage of conventional 32-inch lathe jobs as well as general maintenance and repair work.

The lathe is available in a great variety of center distance capacities. It can be furnished with either eighteen or twenty-seven spindle speeds and with an unusually wide range of threads and feeds. All of the design features found in preceding models of the American Pacemaker lathe are incorporated in the new Style "H" machine and the same accessories are available to the user.

Circle Item 112 on postcard, page 243



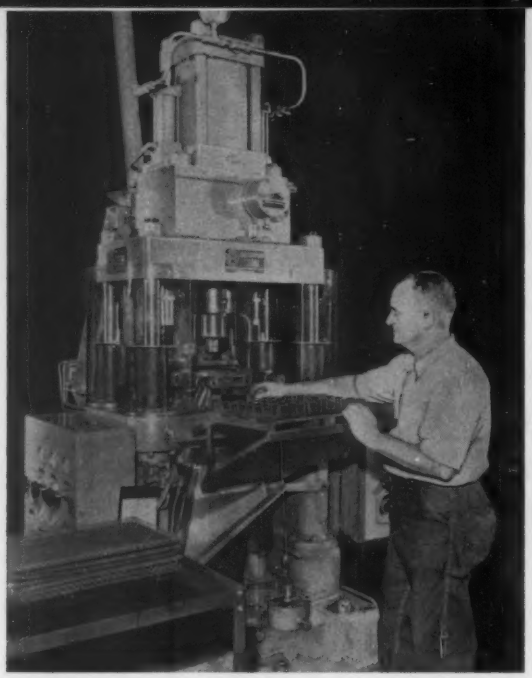
"Nordex" sheet-metal cutting, beading, folding and doming machine

Multi-Purpose Power Cutter

A multi-purpose power cutter referred to as "a sheet-metal shop in one unit" is being manufactured by the Nord Corporation, Nutley, N. J. The "Nordex," as this machine is called, has a detachable crankcase designed to facilitate interchanging, replacing, and repairing parts. Simple tools which can be changed in a matter of minutes, make it available for operations such as straight-, circle- and louvre-cutting, as well as beading, folding, and doming. By the use of special tools many other operations can be performed.

The cutter comes with either a 28 1/2- or a 48-inch throat and has a variable stroke adjustment. It is powered by a 3/4-H.P. totally enclosed 110/220-volt single-phase ball-bearing motor.

Circle Item 113 on postcard, page 243



Baldwin-Lima-Hamilton metal-powder compacting press

A tap set up for inspection on Hanson-Whitney checker

Metal-Powder Compacting Press

A Model "L" 50-ton metal-powder compacting press recently built by the Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa., and installed in the Steering Gear & Machining Plant of the Ford Motor Co., Dearborn, Mich., is said to have doubled the production of pump gears. It is also claimed that in addition to having a higher output, the new press has reduced finishing time and saved a good percentage of the metal (formerly wasted through finish grinding of the gears) by holding dimensions of the blank to closer tolerances.

The exceptionally rigid frame of this press with its heavy bearings and guides assures precise functioning of the moving parts. Punches and core rods are held in true parallelism and squareness with the die so that compacting quality in the form of end squareness and concentricity of the part being compacted is assured.

Circle Item 114 on postcard, page 243

Optical Tap Checker

An optical device designed for inspecting the chordal hook or rake angle of taps is being offered by the Hanson-Whitney Co., Division of the Whitney Chain Co., Hartford, Conn. It measures the angle formed by a line from the crest to the root of the thread, and a radial line to the crest of the thread. The checker is easily adjusted to accommodate all taps up to 2 inches in diameter.

Once an initial inspection set-up is made, an integral vernier can be set to the desired hook angle, and taps compared to this setting without further adjustment. Both external and internal centers are furnished, as well as a V-block for use with taps having no working centers. The checker can also be adapted for measuring flute indexing and chamfer angles.

Circle Item 115 on postcard, page 243

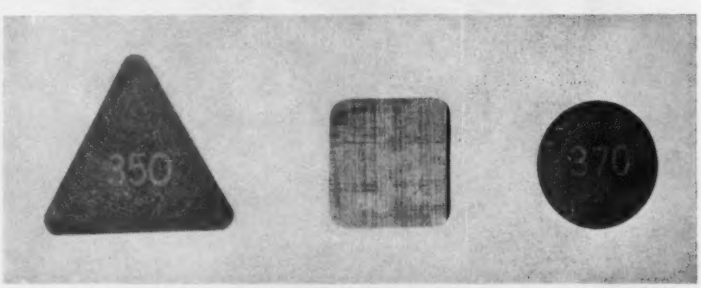
Carboloy Throw-Away Blanks for Steel-Cutting Tools

The Carboloy Department of the General Electric Co., Detroit, Mich., has announced a line of throw-away blanks, including both precision and utility types. On-end types of the new steel-cutting Grades 350 and 370 carbides and standard grades for machining non-ferrous metals have also been added to the company's line. The line of blanks now available covers all ranges of machining from light finishing to extremely heavy roughing work. The new blanks are made "ready-for-use" with standard mechanical tool-holders.

Nine basic sizes with different radii in triangular, round, and square shapes are included in the line. The inserts are available in different thicknesses.

The new line, added to the brazed-tool line, now enables carbide users to order from a single source, all necessary grades or styles of tools for cutting either steel or non-ferrous metals.

Circle Item 163 on postcard, page 243



Carboloy throw-away carbide blanks of three different shapes made in nine basic sizes covering operations from finishing to roughing

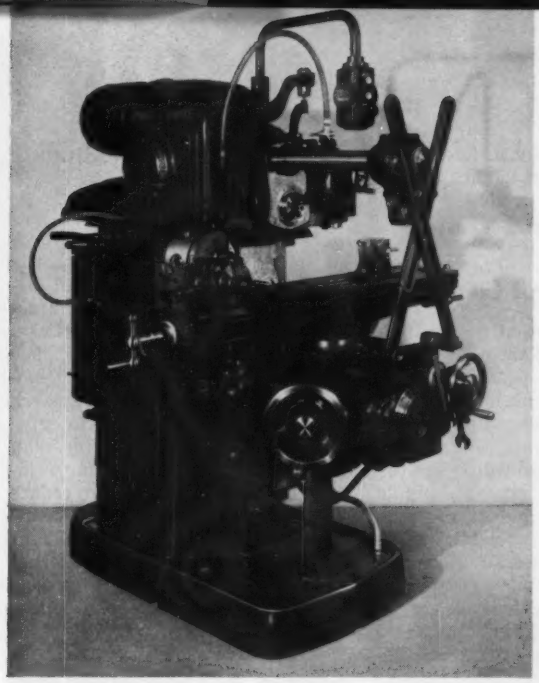


Fig. 1. Brown & Sharpe sliding-head milling machine

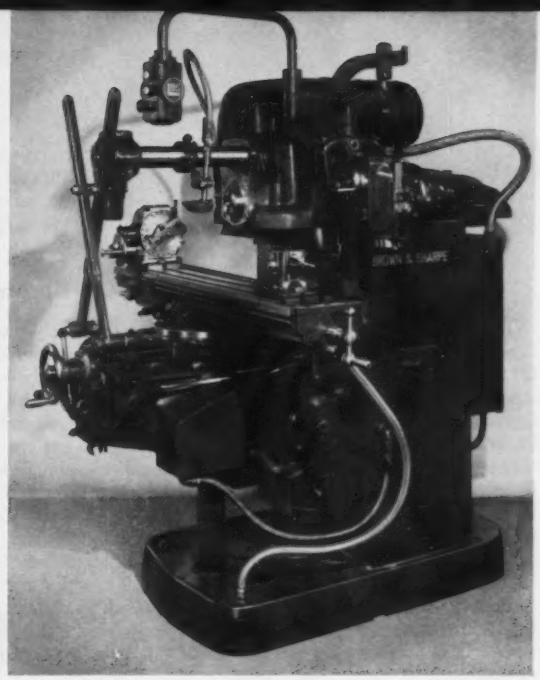


Fig. 2. View showing universal head in storage position

Brown & Sharpe Knee Type Sliding-Head Milling Machines

Exceptional versatility is an outstanding feature of the "Rangemaster" No. 20 universal and No. 20 plain milling machines of the sliding-head type introduced at the Machine Tool Show by the Brown & Sharpe Mfg. Co., Providence, R. I. The wide work range of these machines makes them especially well adapted for use in the production of metal patterns as well as operation in maintenance departments, tool-rooms, and experimental laboratories. The ability to change this machine quickly from horizontal to vertical or angular milling operations also serves to simplify work on molds and dies. It can be used to advantage in the manufacture of parts which must be securely clamped and then machined on many surfaces in different planes without disturbing the work-piece.

The outstanding design feature of this machine is the sliding head mounted on ways at the top of the column. Both a horizontal spindle and a full universal milling-head spindle are furnished on the sliding member. Extremely rigid cutter support is provided in all machining positions and the full power of the 3-H.P. motor is available at either the main spindle or the spindle in the universal milling head.

Eighteen spindle speeds are available for each spindle, ranging from 40 to 1530 R.P.M. for the main spindle and from 80 to 3060 R.P.M. for the spindle of the universal head. Each spindle has a No. 40 milling machine standard taper nose and the cutter equipment is interchangeable. Eighteen feed rates ranging from 1/2 inch to 20 1/4 inches per minute are available for longitudinal, transverse, or vertical feed of the table. The universal head spindle can be fed axially 3 1/2 inches.

The machine "start" and "stop" buttons and the "jog" button for the spindles are all grouped together on a pendant which can be

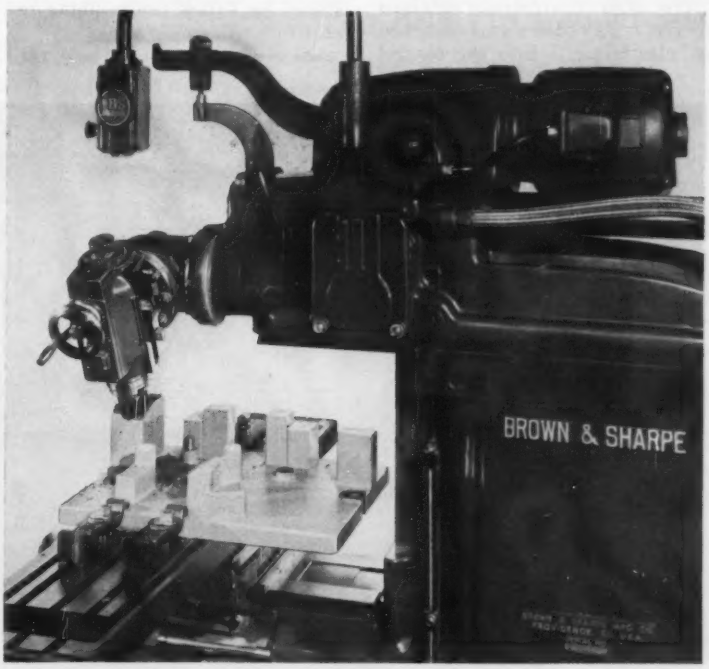


Fig. 3. Typical machining operation performed by universal head of machine shown in Figs. 1 and 2

located at any position convenient to the operator. The machine is automatically lubricated throughout. Attachments regularly available for conventional knee type Brown & Sharpe machines can be used on these new models.

Circle Item 116 on postcard, page 243

Jones & Lamson Turret Lathe with Binotrol Control

The use of a compact punched-tape control system called Binotrol for the automatic operation of a machine tool was demonstrated for the first time at the Machine Tool Show by the Jones & Lamson Machine Co., Springfield, Vt. The Binotrol system, developed by the Barnes Engineering Co., Stamford, Conn., differs from other control devices in several ways. Its simple computer system is compact, the complete control console being no larger than an office desk. The operating principle is designated as digital-to-analog—the reverse of most systems—and requires the use of only a few vacuum tubes. It is composed mainly of dependable telephone type relays. As a functioning control system it is said to be relatively inexpensive and simple to operate. Briefly, it serves to actuate or turn any control normally operated by hand and is adaptable to the automatic control of valves and other industrial equipment.

Completely automatic operation of the Jones & Lamson No. 7 turret lathe illustrated is obtained by feeding a coded signal (punched on plastic tape) into the control console. Each motion of the machine is controlled through thirty-two possible hole positions. With this control the machine starts, stops, and recycles automatically and the operator need never touch the controls. In this case the Binotrol controls sixteen spindle speeds, the turret indexing, cross-slide indexing, coolant, hood, chuck, and bar feed. All tool motions are also completely tape-controlled. Lead-screw accuracy is controlled to within limits of 0.001 inch and the cross-slide motion to 0.0005 inch. The machine units may also be jogged into position by push-button control and manual cranks.

The turret lathe equipped with this control is said to be ideal for short repetitive runs. A process engineer programs the step-by-step operation of the machine for a particular job. These instructions are transmitted to a clerk who punches the required tape, with the aid of a code book. The tape then controls the job and can be employed immediately or stored for future use in filling repeat orders.

Circle Item 117 on postcard, page 243

Electrode for Welding Dissimilar Alloys

A multi-purpose electrode capable of producing strong, ductile joints between a wide range of dissimilar alloys is being manufactured by the International Nickel Co., New York City. This new electrode, developed at the company's Bayonne, N. J., research laboratory, is designed to give high quality welds on better than 90 per cent of the dissimilar welding jobs encountered and to reduce electrode inventories in the average plant. Effective methods of joining Monel, Inconel and other high-nickel alloys using Inco electrodes and filler wires have been developed.

Tests have shown that welds of dissimilar alloy combinations made with Inco-Rod "A" are ductile, "crack-free," and possess excellent strength. In addition, the corrosion-resistance of the weld deposits, in most cases, is superior to the parent metals involved. This welding rod is now available in 14-inch lengths in diameters of 3/16, 5/32, and 1/8 inch. There is also a 3/32-inch diameter welding rod with a center grip. The new electrode is an all-position rod operated on direct-current, reverse polarity. In general, no preheat, postheat, or peening operations are necessary.

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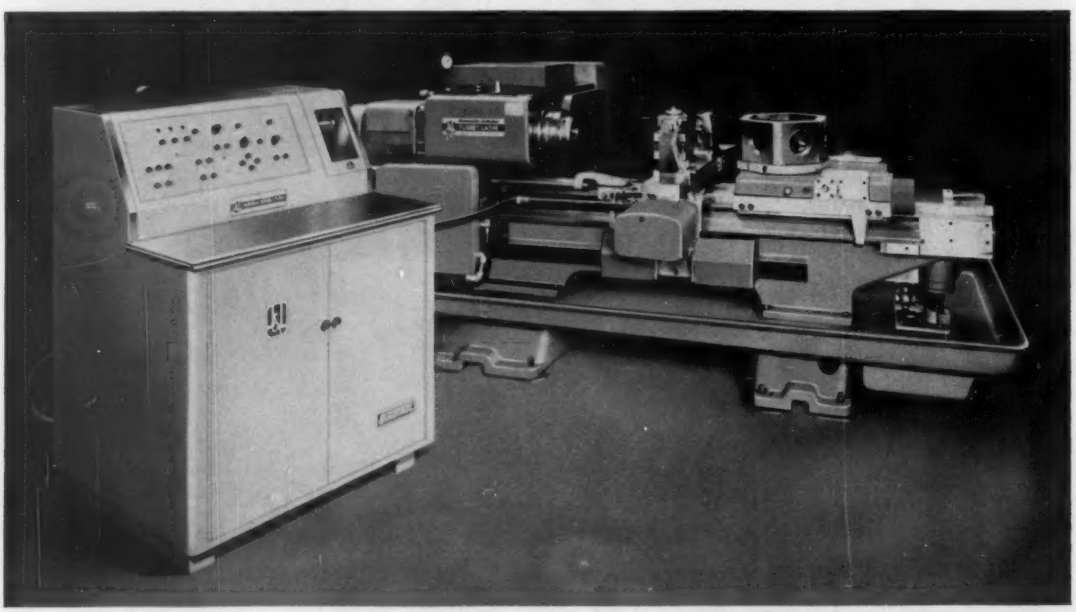


Jones & Lamson turret lathe equipped with Binotrol control for completely automatic operation

Buhr Economatics Equipped to Machine Water-Pump Bodies

Two Economatics built recently by the Buhr Machine Tool Co., Ann Arbor, Mich., are being used to perform thirty operations on water-pump bodies for a 1956 model car. The Economatic C-2863 seen in Fig. 1, which performs the first series of operations, is a five-way drilling and tapping machine. Six single-place work-holding fixtures actuated by a torque-controlled power wrench are mounted on a Powerflo index-table 36 inches in diameter equipped with a shot-bolt locking device. This machine performs nineteen operations at the rate of 135 pieces per hour at 100 per cent efficiency.

Station-by-station operations are: unload and load; drill (horizontally) two 37/64-inch holes, and drill (vertically) one 9/16-inch hole and spot-face one 1 1/2-inch hole; hollow-mill (vertically) one 1 3/16-inch hole and drill two 25/64-inch holes; spot-face (vertically) one hole to 15-degree angular face; drill-through (vertically) five 13/32-inch holes and core-drill one 0.88-inch hole; ream (vertically) two 0.4065-inch holes, drill one 3/16-inch hole, and tap two 3/8-18 Dryseal internal pipe threads.

Processing of the water-pump bodies is continued on the Buhr Economatic C-2872 machine shown in Fig. 2. This two-way drilling and boring machine has six hydraulically actuated holding fixtures, mounted on a 36-inch, six-position Powerflo index-table with a shot-bolt locking device. At the production rate of 135 pieces per hour at 100 per cent efficiency, this machine performs eleven operations, including spot-facing, countersinking, recessing, tapping, and finish-boring.

Operations consist of: load; combination spot-face and countersink one 1 5/8-inch diameter hole, and drill-through one 5/16-inch hole; core-drill one 1 1/8-inch hole and spot-face one hole; special end-ream one hole; 90-degree countersink and spot-face one hole; recess one hole and tap one 3/8-16 hole; and finish-bore one hole to size within limits of 1.1783 and 1.1788 inches; and unload.

Both of these Economatics feature automatic chip removal; complete interchangeability of parts due to closely held tolerances and the location of component assemblies by precision-bored dowel-holes. All multiple heads are of ball-bearing construction with tap-spindles precision-ground and with the threads hard chromium-plated. Electrically controlled automatic indexing is of the cam and roller type with Buhr's exclusive Powerflo index. The ways are of hardened and ground laminated tool steel. Hydraulic and electrical equipment is to J.I.C. standards.

Circle Item 119 on postcard, page 243

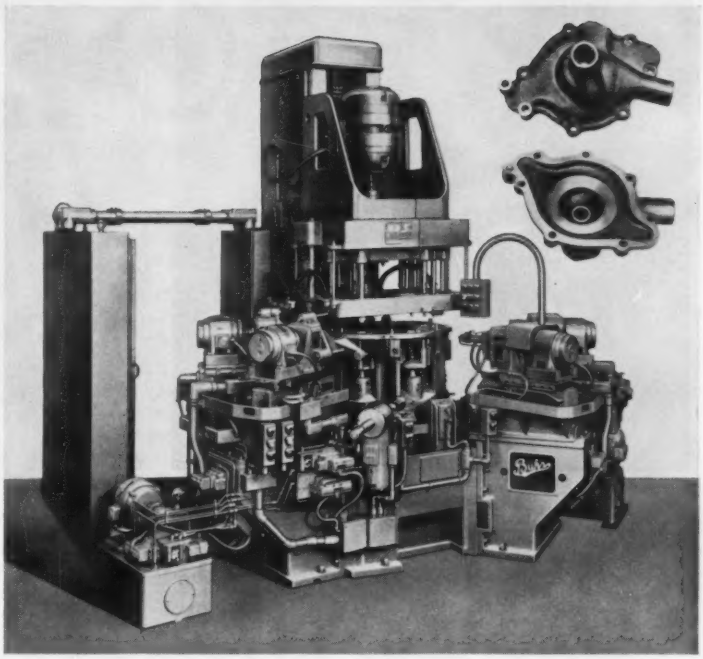


Fig. 1. Economatic built by Buhr Machine Tool Co. for first series of operations on automotive water-pump bodies

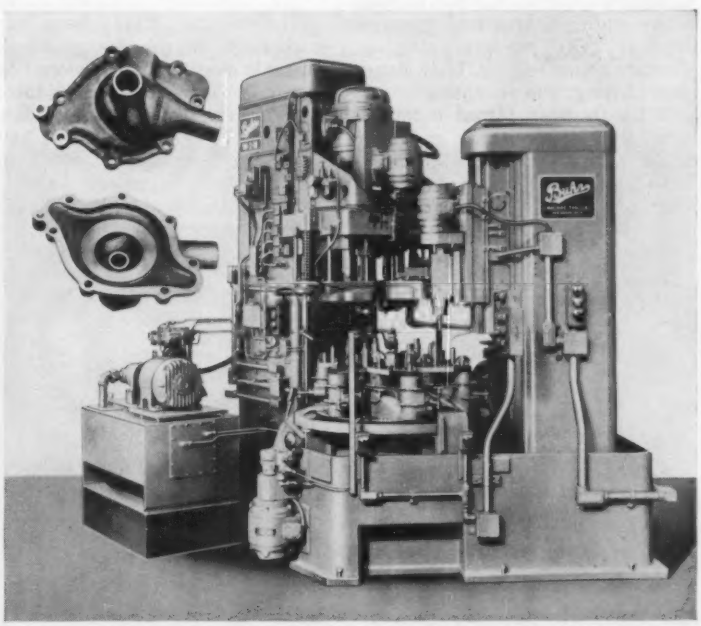


Fig. 2. Buhr Economatic equipped to perform second series of operations on automotive water-pump bodies

Fig. 1. Niagara hand-operated sheet metal-working machine

Fig. 2. Multi-drive power table for motorizing hand machines

Rotary Sheet Metal-Working Machine, and Multi-Drive Power Table

A hand-operated deep-throat combination sheet metal-working machine designated as No. 150 has just been added to the extensive line of power- and hand-operated rotary machines made by the Niagara Machine & Tool Works, Co., Buffalo, N. Y. This machine, Fig. 1, can be readily equipped with twelve different pairs of standard rolls which enable it to perform a wide variety of jobs, including turning, burring, wiring, elbow edging (three types), single beading, "OG" beading, crimping, furnace collar edging, body flanging, slitting, and trimming.

With its deep throat construction and longer shaft ends for wider rolls, this machine is ideally suited to a multitude of operations that cannot be performed on throatless machines. For greatest convenience, work can be fed in either direction with the same clockwise cranking motion. In addition to this new machine, the manufacturer is building a wide variety of rotary machines, rolls, and accessories, including a multi-drive power table, Fig. 2, for motorizing hand machines.

Circle Item 120 on postcard, page 243

Stops for Spring Collets

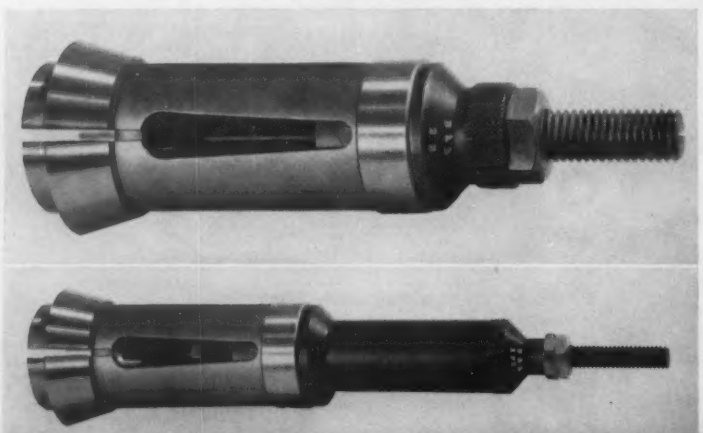
Innovations have been incorporated in the design of adjustable stock-stops for second-operation screw machine work introduced by the Brown & Sharpe Mfg. Co., Providence, R. I. Means have been incorporated in these stops for attaching to standard collets. Special collets with threaded ends, pins, or screws to hold the stop in place are not required. The stock-stops are readily interchangeable in regular spring collets for round and hexagonal stock and are made in spring ejector and solid styles.

Insertion in a collet is simple and fast; the operator merely selects the required stop and inserts it in a collet of corresponding size. A partial turn raises a stock pin in the collet slot and a few additional turns lock the stock securely in place in the collet, ready for use.

In the adjustable spring ejector stock-stops, two adjusting locknuts on the end of the spring plunger shown in the illustration (see lower view) control automatic ejection of work-pieces of varying lengths. Both the adjustable solid stock-stops and the adjustable spring ejector stock-stops are made in three sizes for use with Nos. 10, 11, and 22 spring collets.

Circle Item 121 on postcard, page 243

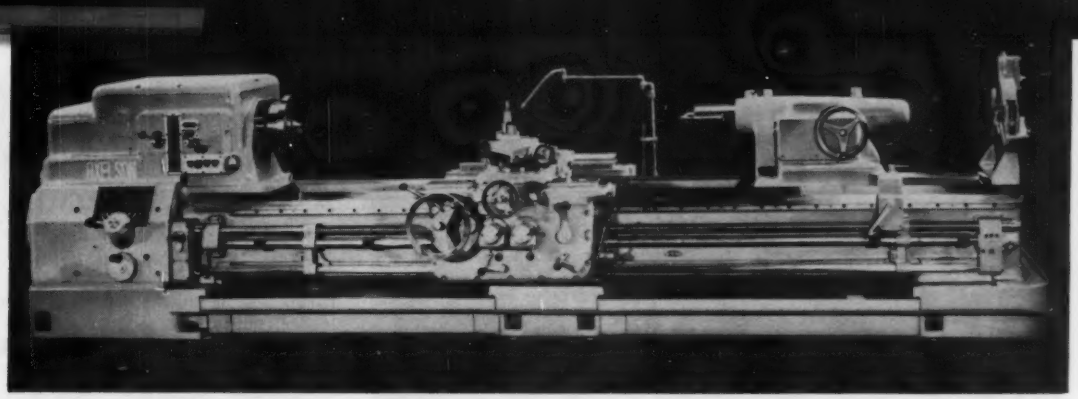
Solid stock-stop and collet, and spring-ejector stock-stop and collet of adjustable types



Axelson Heavy-Duty Engine Lathe

A 32-inch engine lathe with a full 75-H.P. drive, designed for extremely rapid, economical removal of metal, has been brought out by the Axelson Mfg. Co., Los Angeles, Calif.

A horsepower indicator facilitates the selection of feeds and speeds to utilize the maximum output of the motor. Quick, easy selection of spindle speeds is accomplished by two-lever shifting. A standard foot-mounted motor is



Heavy-duty engine lathe brought out by the Axelson Mfg. Co.

connected by V-belt to a pulley on the shaft which drives the headstock gearing without employing a clutch. Starting and stopping of heavy inertia loads is done by electrical plugging. For drives lower than 75 H.P. a clutch is provided.

Spindle speeds range from 6 to 750 R.P.M. All the headstock gears are splash lubricated. Power from the headstock is fed directly through totally enclosed, oil-bathed change-gears down to the gear-box which in turn, is totally enclosed and provides a selection of 81 feeds ranging from 0.005 to 0.35 inch. In addition, a full range of threads may be cut from 1 to 30 threads per inch. Any other thread can be cut through the use of change gears. The selection of any of these 30 threads or 81 feeds is made by a single lever and dial positioner in the gear-box.

The longitudinal rapid-traverse control is located at the left-hand side of the operator to facilitate observation of the cutting tool. Power to the heavy-duty precision cross-feed screw is rigidly contained for slide movement and this, in conjunction with a backlash take-up nut, furnishes smooth power to the cross-feed slide which enables repeat work diameters to be held to size within 0.0005 inch. This close accuracy can be controlled by a new easy-to-read dial.

To the rear of the heavy carriage which carries the cross-slide and compound-slide, is mounted the newly designed taper attachment, embodying an over-size close-coupled swivel-block equipped with take-up gibs. A longer travel of 30 inches and a greater taper per foot provide for a much wider range of work. This movable unit of apron, carriage, cross-slide, auxiliary slide, and taper attachment, moves back on a reinforced bed equipped with hardened and ground steel ways. A tailstock of heavy design is a feature of the lathe. Its heavy-duty spindle uses either dead or live centers.

Circle Item 122 on postcard, page 243

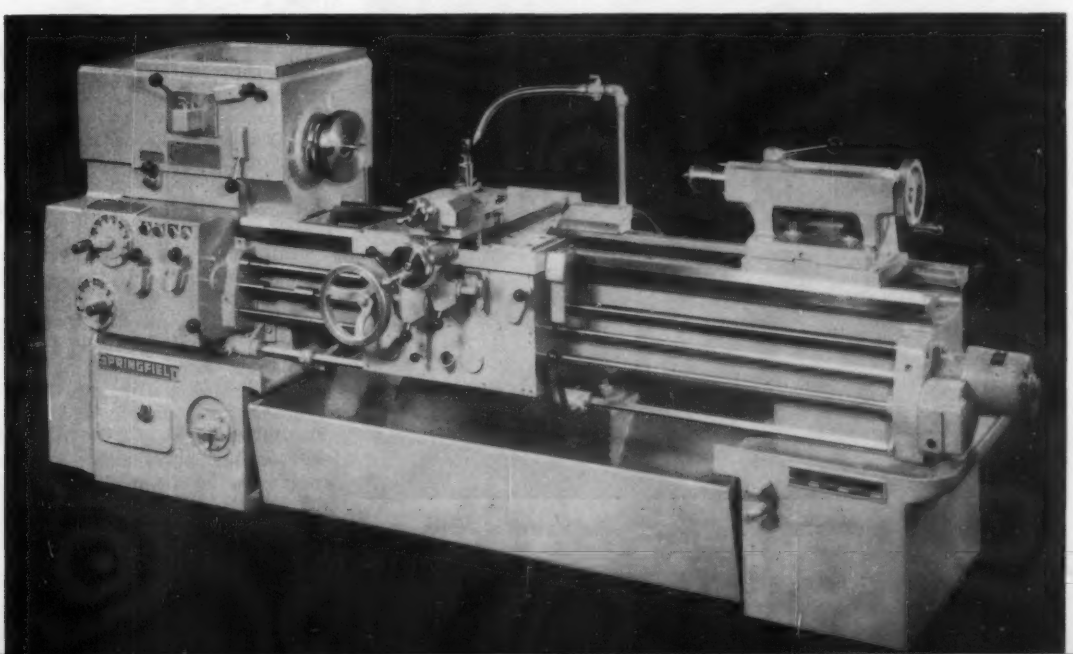
Springfield Engine and Tool-Room Lathe

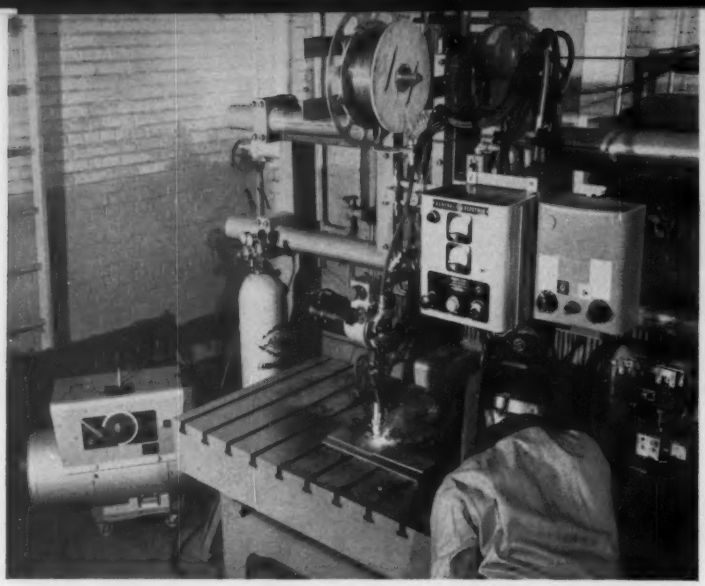
A new lathe, featuring a cabinet redesigned along functional lines and with the controls regrouped for greater simplicity, was introduced at the Machine Tool Show by the Springfield Machine Tool Co., Springfield, Ohio. This new Model 280 lathe is available in either the engine or tool-room type of machine.

Currently being built in a 16-inch heavy-duty size, this lathe is a further development of the company's 180 series machines. New features include totally enclosed head with pressure lubrication to all gears; totally enclosed apron and gear-box with the gears running in oil, a light-weight unbreakable fiber-glass cover which protects the end gearing; and equilateral triangular girthing of the beds.

Circle Item 123 on postcard, page 243

Heavy-duty lathe brought out by the Springfield Machine Tool Co.





Test run of new General Electric automatic Fillerarc welding equipment

General Electric Welding Equipment Designed to Use Carbon Dioxide Shielding Gas

Automatic, consumable-electrode welding equipment, especially adapted for use with low-cost carbon dioxide shielding gas, has been announced by the General Electric Company's Welding Department, York, Pa. This equipment is said to provide a practical method of using gas-shielded welding for mild steel applications at costs which may be the same or below those of submerged-arc welding.

The advantages of the gas-shielded techniques can now be extended to mild-steel fabricating as a result of the adaptability of the new G-E equipment to the peculiar characteristics of carbon dioxide. In addition, superior results with argon or helium gases have been demonstrated with the equipment in welding aluminum, copper, stainless steel, and other ferrous and non-ferrous metals and alloys.

With gas-shielded welding, where a consumable-wire electrode is fed to the arc and no flux is used, the operator has the advantage that he can see the arc clearly and that inexpensive fixtures can be employed.

Successful consumable-electrode, gas-shielded welding—regardless of material or type of gas—which depends upon holding an arc of constant length that is not affected by changes in the wire-feeding speed is accomplished automatically with the new, self-regulating General Electric Fillerarc generator. The complete new G-E Fillerarc equipment includes wire-feeder, torch, control panel, reel mount and motor-generator unit. It employs extremely high wire speeds (up to 1000 inches per minute) and very short arc lengths to produce a deep-penetrating arc with a minimum of spatter. The technique also causes violent agitation in the weld puddle, allowing more porosity-producing gas to escape. As a result, welds are of higher quality.

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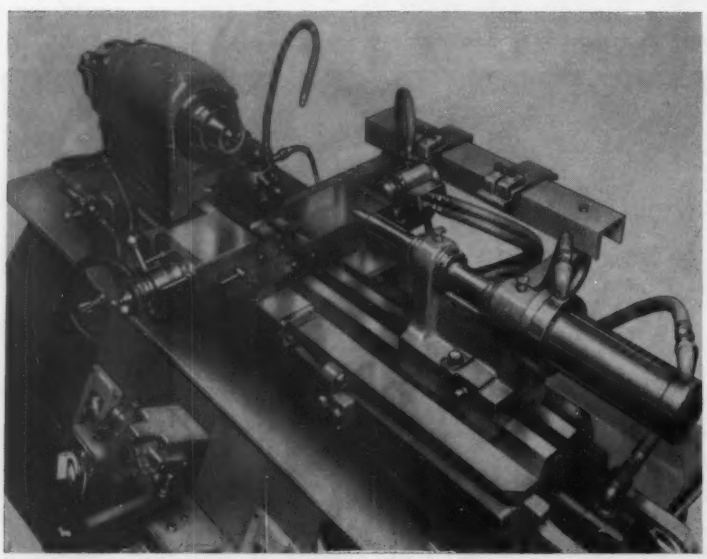

Hydraulic precision tracer lathe introduced by the Elgin Tool Works.

Elgin Precision Hydraulic Tracer Lathe, Hand Screw Machine and Horizontal Mill

A precision hydraulic tracer lathe built by Elgin Tool Works, Chicago, Ill., was on display for the first time at the Coliseum in Chicago. This unit is a completely hydraulic type of copying lathe designed to machine smaller parts in single or production quantities. It has an 11-inch swing, is 17 inches between centers and has a 13-inch carriage travel. The duplicator cross-feed is 1 1/2 inches and the machine will incorporate a spindle drive by a countershaft clutch brake assembly designed for instant starting and stopping. The unit will be furnished complete with an air-operated collet closer and a tailstock controlled from a single selector valve.

A hand screw machine, not illustrated was also demonstrated as a unit representative of the Elgin series of precision lathes. This lathe has a 9-inch swing, 1-inch collet capacity and a spindle speed range of 120 to 3780 R.P.M. which is continuously variable. The machine features a heavy-duty double-tool cross-slide and six-station turret for small parts production on second operations and for machining parts from bar stock.

A horizontal mill was also displayed as representative of the company's line of milling machines. This is a sturdy, precision machine for toolroom and shop. The table is 18 by 4 inches and the continuously variable spindle speeds range from 85 to 2650 R.P.M.

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Pullmax Sheet Metal-Working Machine

The American Pullmax Co., Inc., Chicago, Ill., introduced a new Pullmax Model P-7 sheet metal- and plate-working machine at the Coliseum Machinery Show. This machine, operating on the principle of previous Pullmax machines with stationary lower tool and reciprocating upper tool, has many new and improved features. It has eight different speeds and stroke lengths ranging from 0.059 to 0.244 inch which provide greater versatility in cutting and working sheet metal and plate.

Adjustment of the cutting tools has been simplified and made more accurate for precision cutting that leaves the edges so smooth that no further finishing is required. The upper tool can be lowered in steps, which enables the machine to do an improved job of cutting louvers of different sizes and shapes in sheet metal.

The frame of the machine is made of welded steel plate, and heat-treated and designed for improved strength. The machine has a capacity for edge-cutting mild steel 9/32 inch thick. Attachments are available for straight cutting, circle cutting, louver cutting, dishing, beading, joggling, and edge-bending, in addition to freehand or irregular cutting.

Power is supplied by a 3-H.P. motor. This machine can also be equipped with a power-feed device for moving metal through the cutting tools at speeds up to 20 feet per minute. The machine is equipped with a handwheel attached to the crankshaft, by which the bottom position of the tool stroke can easily be determined and more accurate tool adjustment made possible.

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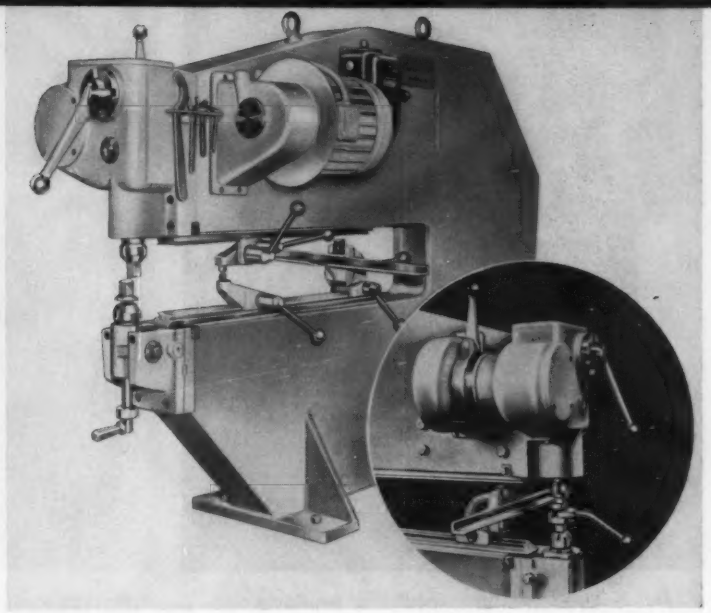

Sheet metal- and plate-working machine which has been brought out by the American Pullman Co., Inc.

Adjustable-Dial Hole Gages

A series of adjustable-dial hole gages, which are said to feature an entirely new solution to the problem of accurate centralization of the gage in the hole, is announced by the Federal Products Corporation, Providence, R. I. Positive centralization of these gages, called the 1250P series, is the result of a new design concept which produces such high centralizing accuracy that careful alignment of the gage laterally is unnecessary in order to obtain correct measurement of the hole diameter. The gage can be quickly and accurately inserted in the hole.

An outstanding advantage of these gages is that they can be accurately set without master rings if desired. The centralizing device is so precisely concentric with the gaging contacts that the gage can be set directly to the flat surfaces of the gage-blocks, and applied to the radius-formed surface of a hole with no significant error.

The four gages in this series cover all requirements for checking holes between 1/2 inch and 8 inches in diameter, with the maximum size for each gage being twice its minimum diameter. They are light in weight, easy to handle, and are fully insulated in a new way so that the heat of the operator's hand cannot affect the accuracy of the gage.

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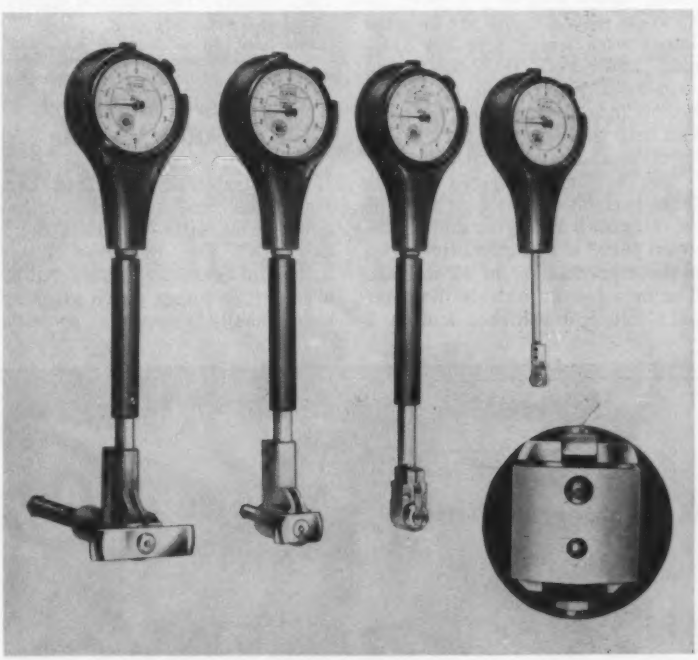
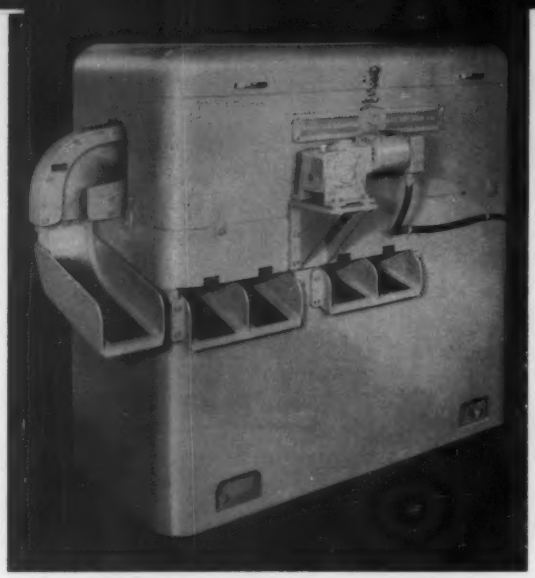
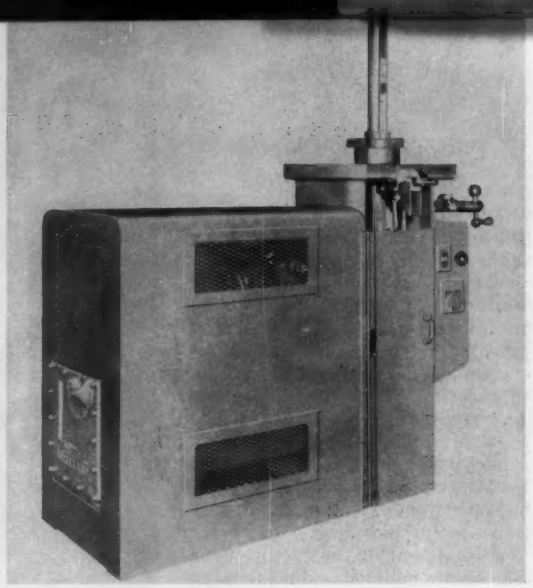


Federal adjustable-dial hole gages of improved design



Red Ring automatic gear checker for inspecting and sorting shaper-cut gears



Hydraulically operated keyseating machine which has been announced by Mitts & Merrill

Red Ring Automatic Gear Checking and Sorting Machine

A Red Ring automatic motorized precision gear-checking machine designed to inspect and sort spur or helical gears produced by conventional gear-shaping methods is now available from the National Broach & Machine Co., Detroit, Mich. The checking machine inspects gears by means of electronic indicators and master gears for incomplete stroke, over-size and under-size teeth, and thick or thin teeth. Gears that do not meet inspection requirements are directed into chutes which sort out over-size, under-size, thick-tooth and thin-tooth gears. The gears are loaded into the machine by hand and fed through the various inspection stages automatically.

The machine illustrated inspects three variables in the gear teeth of an integral helical gear and brake-drum part for an automotive automatic transmission in 15 seconds. The part has an outside diameter of about 5 5/8 inches and is 3 inches long. The gear has 23 teeth of 16 diametral pitch, 20-degree pressure angle and a pitch diameter of 1 1/2 inches. The helix angle is about 15 degrees and the face width 1 1/4 inches.

The checking machine is about 64 inches long 31 inches wide and 4 feet high. A hinged counterweighted cover at the top provides easy access to the interior of the unit which is driven by a 1/15-H.P. motor. The electrical control panel is a separate unit.

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Mitts & Merrill Keyseating Machine

A hydraulically operated keyseating machine has just been announced by Mitts & Merrill, Saginaw, Mich. The cross-head of this hydraulic keyseater is actuated by a vane type pump which gives an exceptionally smooth pressing action. The machine is available in two capacities, the No. 2 machine having a cross-head pull of over 7,000 pounds and the No. 3 machine having a pull of 9500 pounds. The No. 2 hydraulic keyseater will cut keyways to predetermined lengths up to a maximum of 12 inches, whereas the maximum for the No. 3 keyseating machine is 15 inches.

The stroke and feed of the cutter and the tool relief are automatically controlled. These machines are built to cut straight, true keyways with a high degree of accuracy, and they are sturdily constructed for hard use. Larger capacity machines which are now being designed will soon be made available by the builder.

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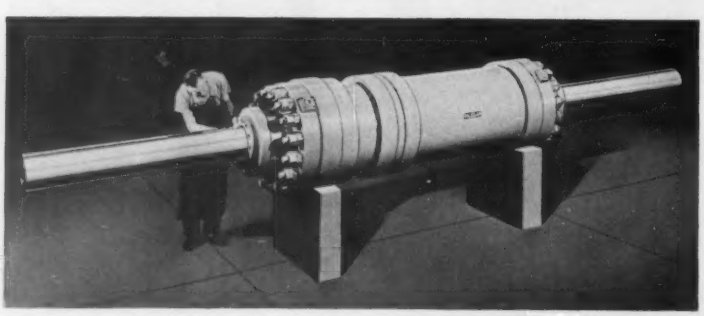

Special double-acting hydraulic cylinder built by the Oilgear Co.

Oilgear Large Size Hydraulic Cylinder

The Oilgear Co., Milwaukee, Wis., has built a special double-acting hydraulic cylinder for operating the billet tongs and stripping ram on a 400-ton vertically mounted hydraulic steel-mill stripping machine. This cylinder has a bore 24 inches in diameter, a stroke length of 84 inches, and operates under a pressure of 3000 pounds per square inch. The mold clamps on the same machine are operated by two Oilgear hollow trunnion-mounted cylinders having 6 1/8-inch bores and 4-inch strokes. All three cylinders are operated from one Oilgear fluid power system.

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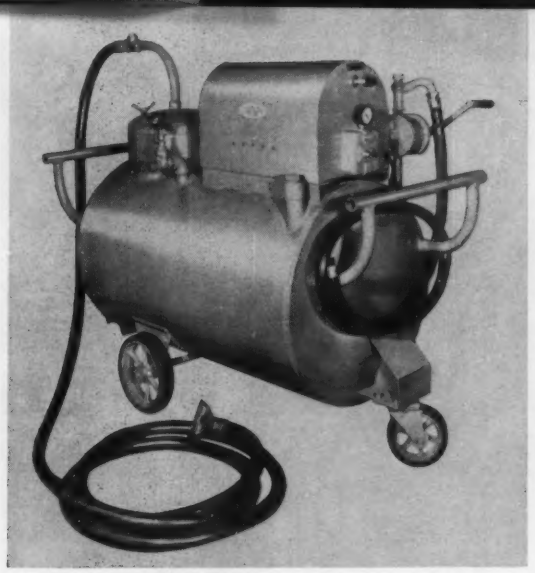
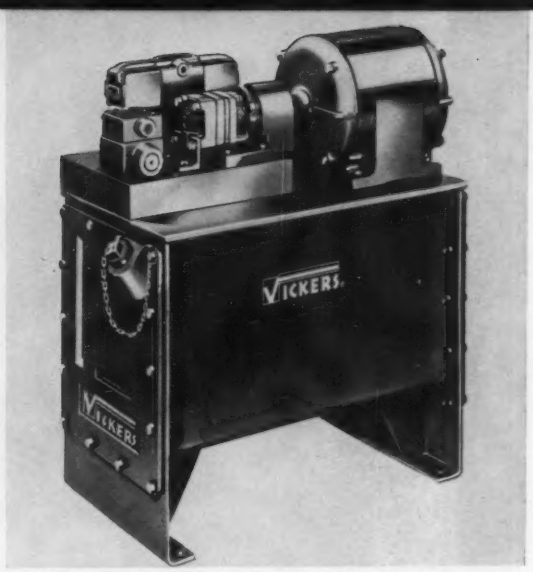


Portable oil-dispensing and sump-cleaning machine introduced by the Coolant Equipment Corporation



Vickers oil-hydraulic pipeless power unit with electric driving motor and a control circuit

Keller Automatic Tapping Tool

An automatic tool called the "Airfeedtapper" has been brought out by the Keller Tool Division of Gardner-Denver, Grand Haven, Mich. This tool features controlled thread-cutting for the high-speed production of accurate threads.

The tapping tool has adjustable torque control, enabling the maximum permissible torque to be delivered to the tap for high output with minimum tap breakage.

A micro-depth adjustment permits the Airfeedtapper to be used for blind-hole tapping. A four-way valve, used to control the tool from any remote station, makes the tapper readily adaptable to automation. Jacobs tapping chucks or Scully-Jones tap drivers are used.

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Light Duty Oil-Hydraulic Power Units

A line of oil-hydraulic pipeless power units featuring compactness, design flexibility, and manifold mounting of control components is now available from Vickers Inc., Detroit, Mich. These packaged units are designed to meet the requirements of a wide range of light-duty industrial applications, such as clamping, indexing, and transfer operations. Designated as the Series T8, they conform to J.I.C. recommendations and include electric drive motors meeting new N.E.M.A. frame size specifications. They are recommended for use with systems requiring operating pressures up to 1000 pounds per square inch.

Pumps and valves are directly connected to a common manifold mounting panel, eliminating all external piping on the power unit itself and minimizing both maintenance and the possibility of leaks. The units have internal oil passages and are similar in concept to the printed circuit panels now used in electrical systems.

Three pump capacities are available as part of the Series T8 power units, these are rated at 2.2, 3.7, and 5.2 gallons per minute at 1800 R.P.M. and zero pressure. Any one of three electric driving motors rated at 1, 1 1/2, and 2 H.P. at 1800 R.P.M. can be used in combination with any one of three optional pumps.

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Carnes Oil-Dispensing and Sump-Cleaning Machine

A portable self-contained unit designed to remove sludge, chips, and oil from machine tool sumps, filter out the waste material, and deliver fresh oil to the machines has been added to the Carnes line of industrial cleaning equipment introduced by the Coolant Equipment Corporation, Verona, Wis. The machine has a capacity of 75 gallons for fresh oil and 75 gallons for the waste oil, sludge, and chips, which enables a single operator to thoroughly clean a machine tool and provide fresh oil in one operation.

A hand-operated pump serves to dispense fresh oil and a 1/2-H.P. motor builds up vacuum in fifteen seconds for the cleaning operation. The unit is mounted on two 12-inch rubber-tired wheels with one eight-inch swivel caster to provide easy maneuverability when moving the equipment.

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"Airfeedtapper" announced by Keller Tool Division of Gardner-Denver

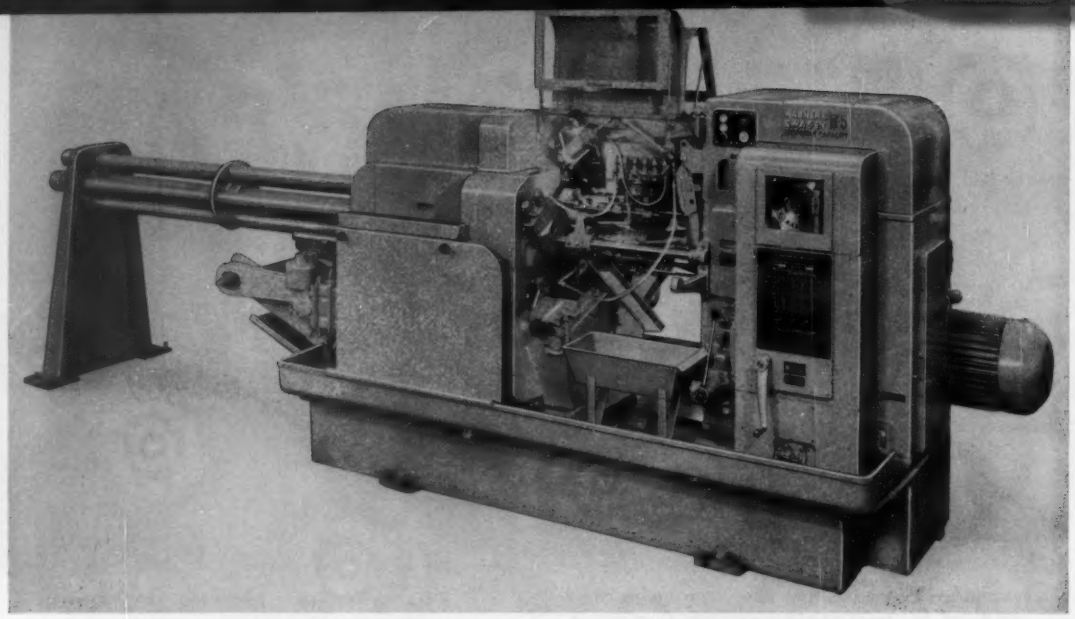

Fig. 1. Warner & Swasey multiple-spindle bar type automatic designed for high production

Warner & Swasey Multiple-Spindle Automatics, Turret Lathe, and Universal Ram Type Machine

Among the machines displayed in operation at the Machine Tool Show by the Warner & Swasey Co., Cleveland, Ohio, were two multiple-spindle bar type automatics designed to combine the set-up speed and simplicity of a turret lathe with the high productive advantages of a multi-spindle automatic. Both the five-spindle machine shown in Fig. 1, and the six-spindle model were displayed in operation producing parts typical of the work handled in many shops equipped with machines of this kind. All tooling used in the demonstrations conformed with accepted multi-spindle practice, such as would be utilized for medium lot production where a large variety of parts are to be machined.

Feed-strokes on these five- and six-spindle automatics are obtained simply by positioning sliding blocks on graduated quadrant scales, thus eliminating tedious hours of set-up time in changing heavy, hard-to-reach cams. All tool-slides are provided with a fine adjustment for setting stroke limits, and the cross-slides, with their micrometer dials, also can be adjusted quickly and accurately.

Ample tooling stations—twelve on the five-spindle and fourteen on the six-spindle machines—permit combining a wide variety of tooling groups with plenty of free space for chip clearance and the introduction of coolant.

Twenty-four spindle speeds are available by means of pick-off gears and a high-low clutch lever. Eighteen feed rates are obtained by means of a simple lever shift.

The five-spindle automatic handles bar stock up to 2 1/4 inches in diameter, is equipped with a 15-H.P. motor and has spindle speeds ranging from 130 to 1414 R.P.M. The six-spindle bar automatic has a capacity for handling bar stock 1 1/4 inches in diameter. It is furnished with a 20-H.P. motor, and has a spindle-speed range of from 255 to 2781 R.P.M.

The No. 3 "Warner & Swasey Electro-Cycle" turret lathe shown in Fig. 2 was also demonstrated in operation at the show. This machine equipped with a new two-jaw air-operated indexing chuck, was engaged in machining a typical forged-brass tee. Complete machining and threading of three ends of this forged part was accomplished in one chucking without stopping the machine spindle. Where similar machining is required on more than one end of a tee, time can be saved by indexing the chuck rather than the hexagon turret. The air-operated indexing chuck is said to facilitate better work flow during production

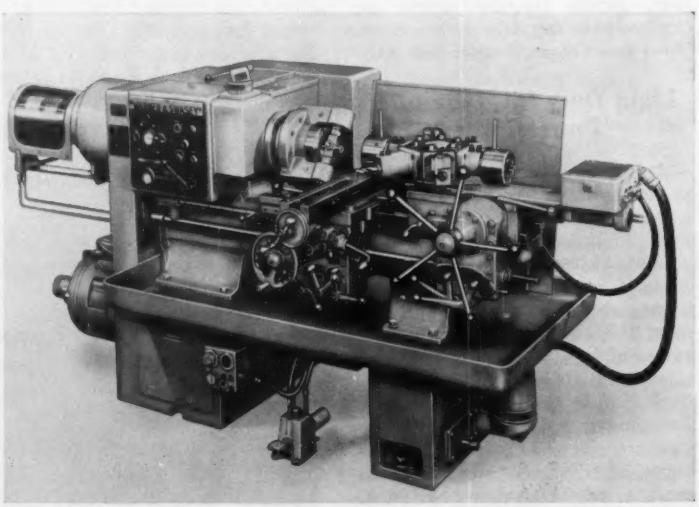

Fig. 2. Electro-Cycle turret lathe introduced by Warner & Swasey Co.

runs, and by reducing work-piece handling, helps eliminate scratches and nicks on the finished parts.

Automatic control of such spindle functions as speed changes, starting, stopping, reversing, and positioning during operation are features of the No. 3 Electro-Cycle turret lathe. This lathe has a two-speed 7 1/2-H.P. driving motor and a series of quick-change sheaves which provide speeds from 87 to 2470 R.P.M. in ten ranges of four speeds each. With this wide range of speeds available, machining of heavy-duty steel work using carbide cutters, as well as the machining of light steel and non-ferrous work requiring frequent starts, stops, and reversals, can be easily handled. The full universal cross-slide carriage offers six power feeds—both cross and longitudinal—with six power feeds also available in the carriage unit of the hexagon turret.

The Warner & Swasey No. 5 universal ram type turret lathe shown in Fig. 3, has a 2 1/2-inch bar capacity and a 20-inch chucking swing. Twelve spindle speeds from 52 to 1316 R.P.M. are provided by the single lever, preselector speed control headstock. This lathe is equipped with a new Warner & Swasey hydraulic contour tracing attachment designed for both contour turning and facing work. Using either flat or round templates as the master pattern, the tracer controls up to four rough cuts and one finish cut during operation. Turning length with the attachment is limited only by the lathe capacity.

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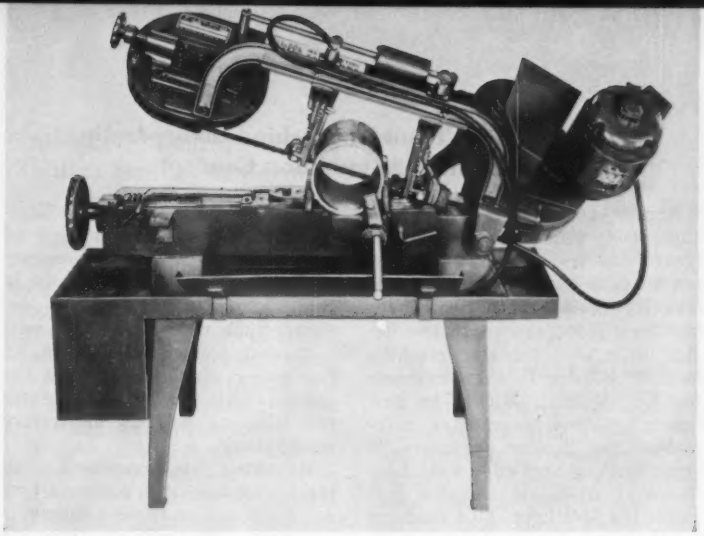

Metal cut-off saw brought out by Wells Mfg. Corporation

Wells Cut-Off Saw of Increased Capacity

At the recent Machinery Show the Wells Mfg. Corporation, Three Rivers, Mich., introduced a new horizontal metal-cutting band saw designated Model 600 which will replace its No. 5 machine. This larger machine is intended especially for metal cutting on medium production jobs and general utility, or tool- and stock-room work.

Features of the machine include constant-load blade-tensioning; safety switch with thermal overload protection and automatic stop after each cut; adjustable, uniform gravity feed of counterbalanced frame; extra rigid, heavy-duty cast-iron frame and I-beam; efficient V-belt drive with four selective speeds; adjustable ball-bearing guides for stabilizing the 5/8-inch wide blade; and sealed type ball-bearing motor.

The machine will cut rectangular work 6 by 13 inches, and will handle round bars 6 3/4 inches in diameter or 6-inch pipe. The blade is 8 feet 2 1/2 inches long and 0.032 inch thick. Selective speeds of 50, 90, 160, or 250 feet per minute are available. The machine requires a floor space 21 by 50 inches.

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Pangborn High-Production Descaling Machine

The Pangborn Corporation, Hagerstown, Md., has developed a Model ES-537 Rotoblast machine for high-production descaling of hot-rolled sheets, plates, and coils. This machine is capable of cleaning both sides of sheet, coil, or plate material simultaneously at the rate of 360 square feet per side per minute.

The machine will remove the scale quickly and uniformly from steel sheets, plates and coils taken right from the mill. The eight standard Rotoblast wheels of this machine are capable of throwing 480,000 pounds of abrasive per hour. The machine is said to descale the surface so thoroughly that the smallest defects are observed easily, thus simplifying inspection. One man can handle the entire cleaning operation by push-button controls.

Standard blasting equipment includes eight 5-inch vane wheels, each of which is powered by a 40-H.P. motor having a speed of 1800 R.P.M. The machine is approximately 24 feet high, 18 feet wide, and 22 feet long.

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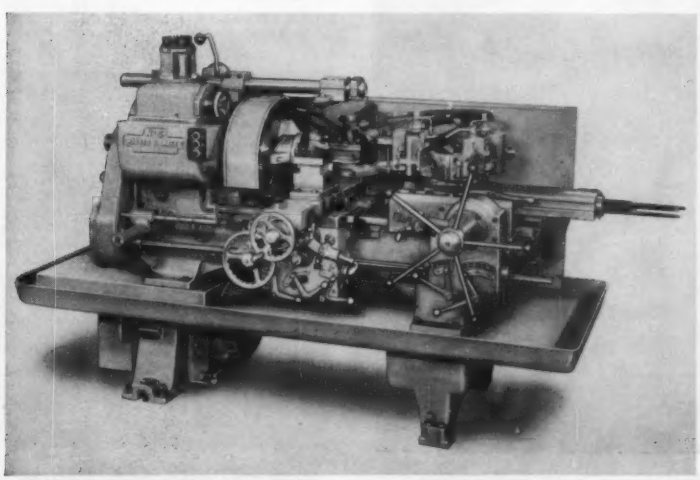

Fig. 3. Warner & Swasey universal ram type turret lathe

Snyder In-Line Transfer Machine Incorporating Segmented Automation Concept

A new concept in machine tool automation which is claimed to decrease obsolescence cost factors, permit part design flexibility, and simplify maintenance procedures has been incorporated in the design of a new transfer machine built by Snyder Tool & Engineering Co., Detroit, Mich. The new concept, named "segmented automation" by Snyder engineers, is being initially applied to a seventy-five station in-line transfer machine 111 feet long. This machine is equipped for producing cast-iron oil-pump bodies for automotive transmissions of the automatic type. Production is at the rate of 144 pieces per hour at 80 per cent efficiency.

With this equipment, operations are performed by individual machines or segments. Each has individual base and slide units, as well as individual control panels. The only connection between the segments is a single transfer bar that moves parts in process from one machine segment to the next. A small, compact master electrical control panel integrates the functions of the individual panels that control each machine segment.

The transfer bar used in the segmented concept arrangement is made up in sections, thus facilitating the removal or addition of base and slide units. No separate hydraulic power units are used in the segmented automation designs. Each slide unit has a self-contained power unit driven by the motor which also drives the spindle. This power unit operates the slide as well as all fixture mechanisms.

By using this segmented automation system, it is a simple procedure to add or remove segments as part design requirements change. All that is required is to disconnect the transfer bar, lengthen the machine by moving the other segments, insert the new required bases, control panels and transfer bar sections, and make necessary minor alterations in the master control panel. With this system each segment has its individual control panel, thus eliminating the large master control panels which frequently extended the full length of the machine and presented troublesome maintenance problems.

The transfer machine illustrated, to which the segmented concept is first being applied, performs a variety of drilling, reaming, spot-facing, chamfering, counterboring, milling, tapping, and boring operations on a front pump body about 7 1/2 inches in diameter by 2 1/4 inches thick. New arrangements in in-process gaging are employed in this machine. Most small holes are gaged with a probe that shuts down the machine if the holes are not drilled through the work. In-process gaging with an automatically controlled air gage is being introduced on this Snyder transfer machine for the first time.

The segment between the two machine sections is a hydraulically controlled index fixture that turns the part over and rotates it before it enters the second machine section. This segment is utilized as the auxiliary loading station if the first section is shut down for tool change or maintenance.

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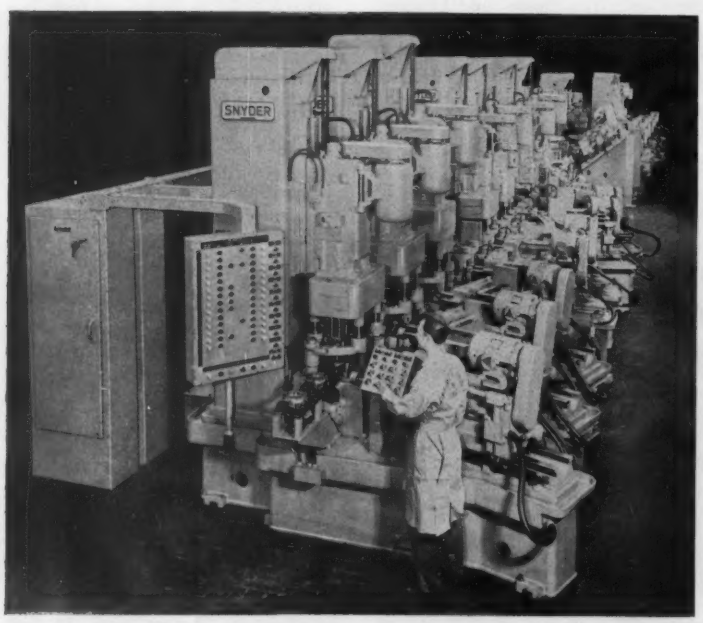
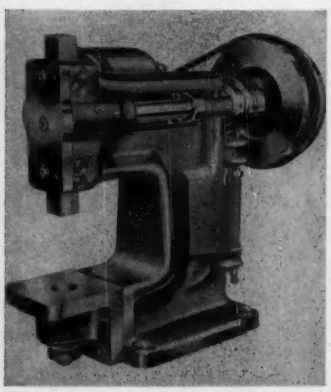


Snyder in-line transfer machine for processing oil-pump bodies which incorporates new segmented automation concepts

Allen Bench Type Punch Press

A Model LTX bench type power punch press designed to handle small and difficult work is being manufactured by the Alva Allen Industries, Clinton, Mo. This machine is especially adapted for slotting, cutting, pinking, scoring, marking, embossing, perforating, and crease-punching leather, plastics, textiles, paper, fiber, and metal. It can be used in many cases to release larger machines for heavier work, often handling the smaller work faster and more economically than can be taken care of on the larger presses.

The press has an extra large die space with a 4 1/2-inch throat and a stroke of 1 inch. Foot opera-



Bench type punch press made by Alva Allen Industries

tion leaves both hands free for material handling. Continuous operation is at the rate of 250 strokes per minute. A 1/3-H.P. motor is required for the direct V-belt drive. The weight of press is only 110 pounds.

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Dodge Ball Bearings for Medium-Duty Service

A series of ball bearings for medium-duty service has been added to the 30,000-hour line made by the Dodge Mfg. Corporation, Mishawaka, Ind. These new SCM ball bearings embody all the features of Dodge SC ball bearings and in addition provide more load-carrying capacity. They are also available in larger shaft sizes. The new line includes both pillow block and flange cartridge mount types.

The semi-steel outer housing of the pillow blocks provides greater strength and a trim, streamlined appearance. Full self-alignment is provided by the spherical outer race of the ball-bearing inner unit, which fits accurately into the spherical seat in the semi-steel housing as shown in the cut-away section of the illustration.

Metallic-backed synthetic seals are mechanically anchored in position and will not blow out under grease-gun pressure. The lubricant is effectively sealed in and dust and dirt are excluded. A locking pin prevents rotation of the outer bearing race while allowing full self-alignment. The bearings are securely locked to the shaft by means of two set-screws. They are completely assembled, adjusted, pre-lubricated, and ready to mount on the shaft.

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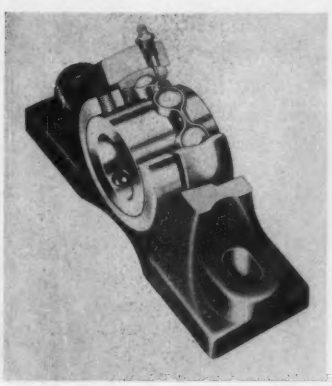


Dodge ball-bearing pillow block with improved lubricant seal

Allegheny Ludlum Steel-Cutting Grades of Carmet Cemented Carbide

The Carmet Division of the Allegheny Ludlum Steel Corporation, Pittsburgh, Pa., has developed two new types of cemented carbides for use in the machining of steel. These new grades replace older grades at no extra cost and are said to offer longer tool life and lower machining costs.

A new anti-cratering ingredient called "Crystalloy," used in the two new carbides is claimed to give the tungsten-titanium carbide steel-cutting grades their superior performance. In producing Crystalloy material, titanium metal is used in place of titanium dioxide as a basic raw material. This is said to give greater impact strength combined with maximum cratering resistance.

Applications selected for field testing of these cutting tool materials ranged from small high-production screw machines to large planers, covering all conditions. Test applications included turning tools, milling cutters, boring tools, and most applications where cratering is troublesome. From the results obtained by these tests a completely new series of Carmet steel cutting grades has been developed. The first two, now commercially available, are the grades CA-610 and CA-608.

Grade CA-610 is designed for use where breakage is the factor limiting tool life and Grade CA-608 is recommended for light machining and finishing where the conditions limiting tool life are edge wear and cratering.

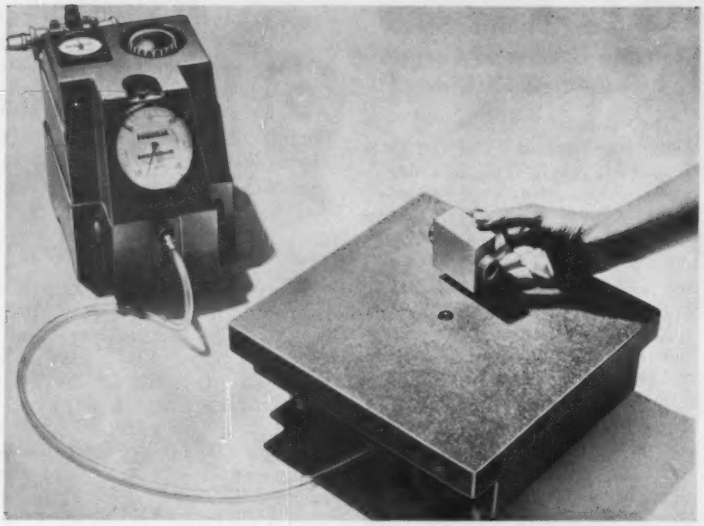
Circle Item 140 on postcard, page 243

Federal Flatness Gage

A rapid and extremely accurate method of checking surface flatness through the medium of air gaging is provided by a gage now being manufactured by the Federal Products Corporation, Providence, R. I. This gage, designated as Model A-582 B-4 has two essential parts. One is a Federal Dimensionair air gage, equipped with a universal air-gaging spindle known as the AirProbe. The second part is a Rahn black granite surface plate. The surface plate regularly furnished is 12 by 12 by 3 inches and has a guaranteed accuracy of 0.000050 inch for any 2- by 2-foot area. Plates of other sizes or accuracies will be furnished on request.

The AirProbe is set into the center of the surface plate so that the contact point extends slightly above the surface. This AirProbe is connected to the Dimensionair by a 3-foot plastic hose which allows the dial to be placed where it can be conveniently read by the inspector.

Carmel Grade CA-610 cutting 4140 steel, heat-treated to a tensile strength of 150,000 pounds per square inch, using a speed of 134 R.P.M.



Equipment for extremely accurate checking of surface flatness announced by the Federal Products Corporation

To check flatness, a part is placed on the surface plate and moved across the contact point. Any variation in the surface will depress the spindle a different amount and this difference can be read on the Dimensionair dial in increments of 0.000050 inch or 0.000020 inch, depending on which model Dimensionair is used.

The AirProbes can be supplied in ranges of 0.003, 0.006, 0.015 and 0.030 inch to suit various tolerance ranges. The gage can also be used as a height or depth gage by the addition of special AirProbes with longer contact points.

Circle Item 141 on postcard, page 243

Sheffield Gages for Checking Gear-Drive and Stator-Blade Carrier Assemblies

The end play of both driving and driven gears are checked within limits of 0.0008 to 0.0018 inch, and the average crescent height to a given surface are checked within limits of 0.0000 inch to 0.0003 inch, with a Plunjet gaging assembly made by the Sheffield Corporation, Dayton, Ohio. The gaging assembly, Fig. 1, consists of a Plunjet supporting ring with rest pad. Two error-proof pins are so positioned as to allow the two Plunjets to contact the crescent surface. The end play of the driving gear is checked by its set of three Plunjets. The position of the floats in their Precisionaire columns indicate whether the dimensions are within the specified tolerances or the amount of any error.

The Sheffield gaging assembly shown in Fig. 2 is used for checking the outside diameter, inside diameter, concentricity of outside and inside diameters, three lengths, and a bore diameter of a stator-blade carrier.

The part is loaded over a gaging spindle into an air ring which is placed over a gaging spindle. A tungsten-carbide inserted rest surface assures accurate location. The gaging spindles and air ring are chromium-finished. The small and large inside diameters and the outside diameter of the hub are indicated by float positions in their respective Precisionaire columns. Concentricity of the large inside diameter with the outside diameter of the hub is indicated by the difference in the level of floats in two adjacent Precisionaire columns as the part is rotated through an angle of 180 degrees. Concentricity is indicated irrespective of the out-of-round condition of the part.

The ball-mounted slide unit, carrying the Plunjet gaging units, is lowered into place by actuating a handle at the side of the gaging assembly. The three length-dimensions are then indicated by float positions in their respective Precisionaire columns.

Circle Item 142 on postcard, page 243

Fig. 1. Sheffield gaging equipment which is used for checking a gear-drive assembly

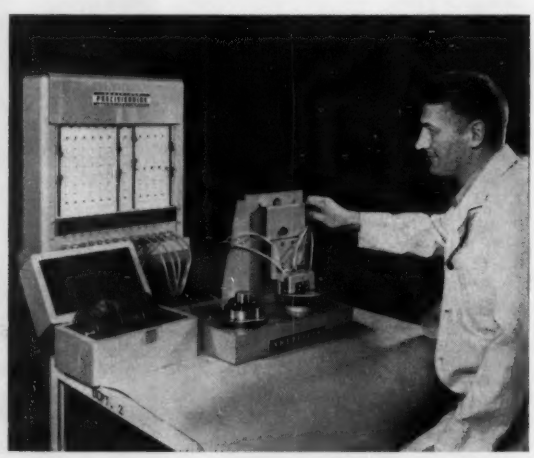
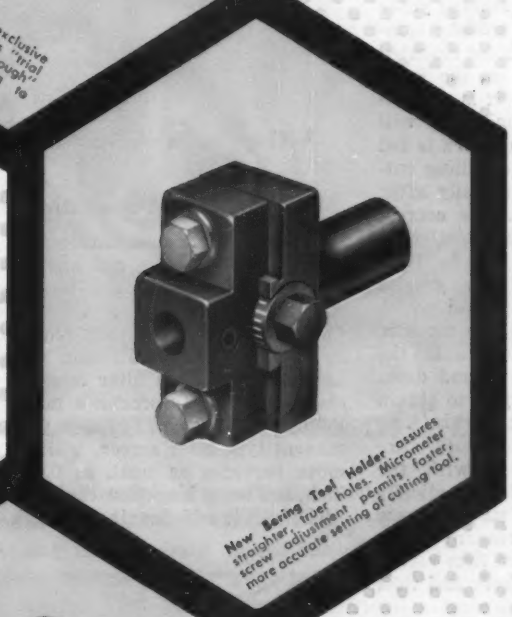


Fig. 2. Gaging stator-blade carrier assemblies with Precisionaire and Plunjet units

9 new screw machine tools

new convenience!
new capacity!
new ruggedness!

New Style-A Box Tool with exclusive micrometer graduations ends "trial and error". Permits quick "rough" setting — easy, final setting to thousandths.



New Boring Tool Holder assures straighter, truer holes. Micrometer screw adjustment permits faster, more accurate setting of cutting tool.

New Thread Bell Holder for front or back cross slide. A low-cost tool for practically any rolling requirement.

Brown & Sharpe

B·S

Advanced-design makes these new 00-size Brown & Sharpe Tools extra-efficient in every respect! Increased capacity to ½" max. Faster, easier adjustments. Greater strength and durability. Highest accuracy over long periods of peak production. Besides the three tools shown, these new tools include: balance turning tool, non-releasing and releasing tap holders, floating reamer holder, adjustable knurl holder, and a universal tool post for square tools. They're perfect complements of Brown & Sharpe "Automatics". Write for illustrated catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

Ex-Cell-O Profiling Machines for Processing Jet-Engine Blades

Two new large-size profiling machines for milling and grinding, respectively, the airfoils of forged jet-engine compressor blades, have been developed by the Ex-Cell-O Corporation, Detroit, Mich. These new machines, Style 186 for milling, and Style 187 for grinding, accommodate blades having airfoils up to 6 inches wide and 18 inches long. They have been developed especially to handle the larger blades used in compressors for the newer engines.

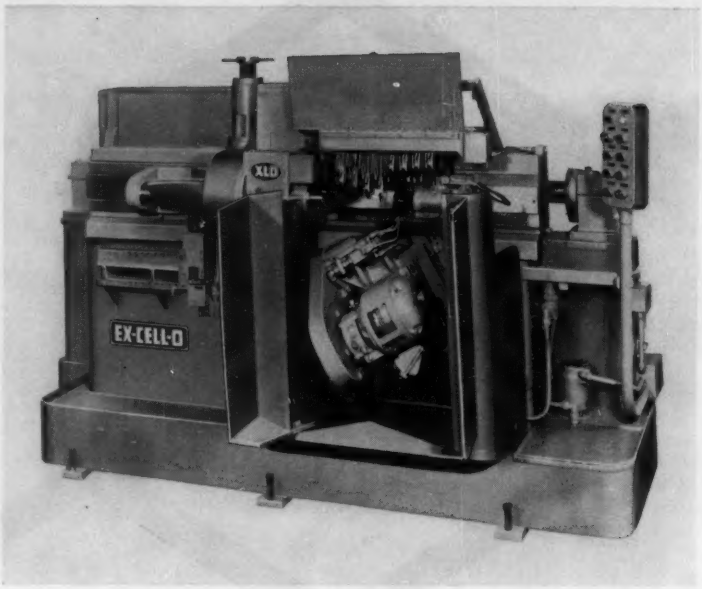
The Style 186 precision profile milling machine, like the smaller Style 86 introduced several years ago, has a precision milling spindle with its driving motor mounted on an angular slide on the front of the machine base. It is now being used to mill titanium as well as stainless steel. The work is fed lengthwise across the milling cutter, and is indexed radially after each cutting stroke. The correct position of the blade relative to the cutter is maintained at all times by an accurately ground steel cam on the work-head, which engages a follower on the machine base. This arrangement causes the work-head to pivot up and down during the milling cycle to obtain the required form on the blade.

Roller type back-rests are brought into contact with the work, and are locked hydraulically before each cutting stroke. These rests do not exert pressure on the blade, but they afford firm resistance to cutting pressure and thus prevent deflection.

The Style 187 precision profile grinding machine is similar in appearance to the milling machine, and it uses the same type of cam to control the height of the work in relation to the grinding wheel. However, instead of feeding the blade lengthwise, as in the case of the milling machine, the grinding machine rotates and at the same time feeds the blade across the grinding wheel.

Both of these profiling machines perform their work automatically after the blade has been loaded and the cycle started. The precise control of the work-heads by accurately ground cams produces blade airfoils well within the tolerances specified on all dimensions of the work.

Circle Item 143 on postcard, page 243



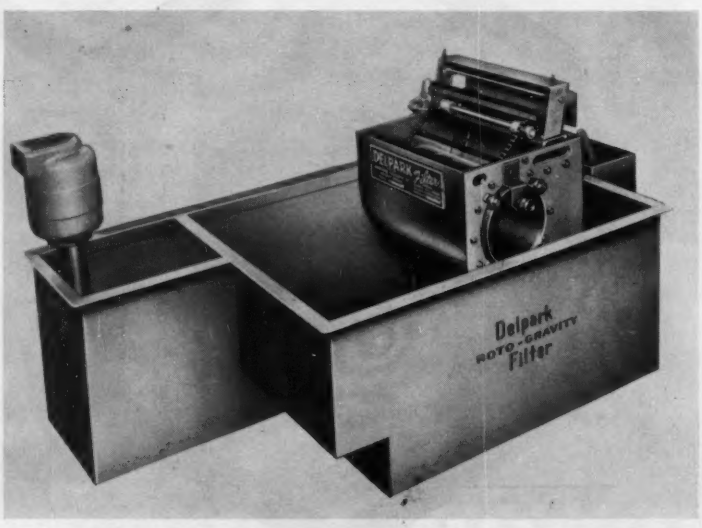
Profiling machine which processes large-size jet-engine compressor blades

Delpark Automatic Rotary-Gravity Type Filter

Continuous full-flow filtration of coolants, cutting oils, and numerous industrial fluids can be accomplished with the Delpark "Roto-Gravity" filter announced by the Industrial Filtration Co., Lebanon, Ind. This filter is especially designed to occupy a minimum of floor space. It has a permanent type filter screen, will remove particles as small as 0.002 inch, and has a large flow capacity.

The unit is self-cleaning through a reverse-flush principle operating on a time-lapse sequence. Residue cleaned from the bar stock type screen is removed by chain-driven flights. The particular unit illustrated is mounted in a tank to fit around the base of a Cincinnati grinder. Tanks of special design and application are available. The sizes available have capacities ranging from 20 to 100 gallons per minute.

Circle Item 144 on postcard, page 243

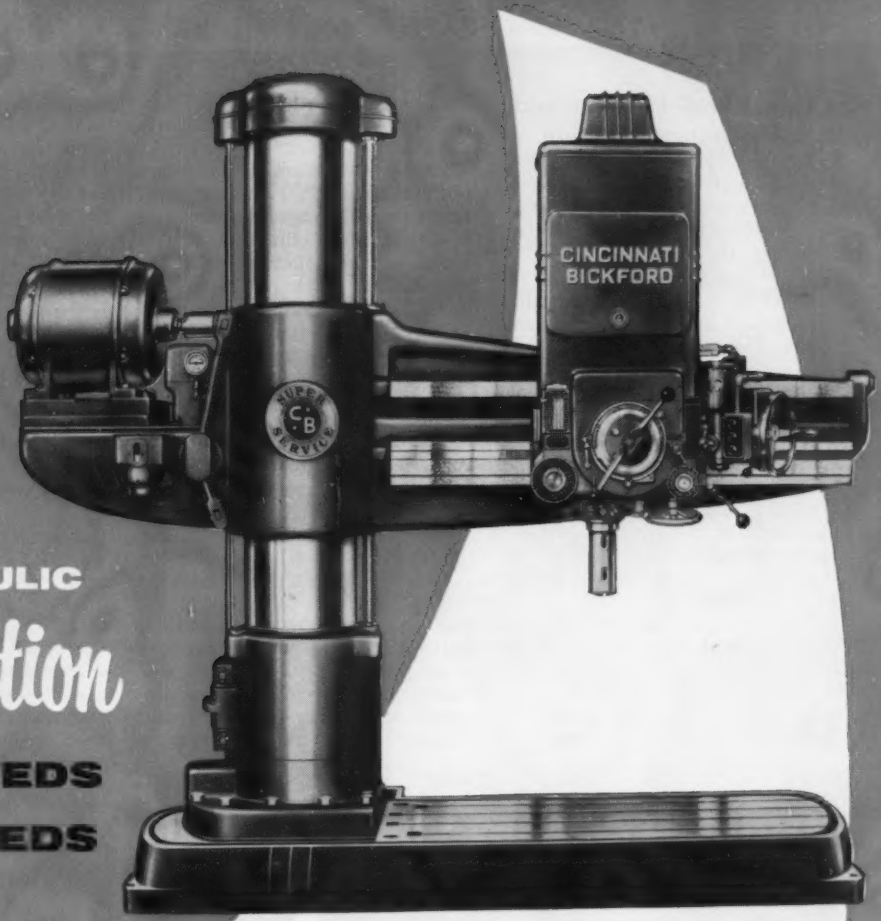


Delpark coolant filtering unit announced by Industrial Filtration Co.

NEW

100% HYDRAULIC *preselection*

of 36 SPEEDS and 18 FEEDS



plus... SIMPLE PRESCHEDULING

Pre-selection of all speeds and feeds is a new development in radial drill design that saves time and effort. At any time, merely turn 2 convenient direct-reading dials to the proper speed and feed for the next operation. Gears shift hydraulically—quietly and quickly.

Pre-scheduling of radial drill operations is conveniently and simply done without expensive, complicated programming attachments on Super Service Radials. These features will cut drilling costs.

◀ Get all the facts by writing for Booklet R-33.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

Cabinet Model Pinion- and Gear-Cutting Machine

A cabinet model pinion- and gear-cutting machine designed to supersede its bench model is being built by the Waltham Machine Works, Waltham, Mass. General specifications of the new machine are similar to those of the older model. The motor and counter of the new model are contained within the cabinet on a swing mounting. The lever shown at the left side of the cabinet is used to lift the motor and thus remove the belt tension. The lever can be latched in the top position to allow the operator the freedom of both hands for shifting the V-belt on the cone pulleys to obtain variations in speed.

The machine has a self-contained coolant pump unit which is quickly and easily removed for cleaning purposes. The chip screen is in the form of a drawer located in the top front part of the cabinet. Chips are disposed of periodically by removing the drawer and emptying its contents.

Push-button starting and stopping is provided for on all models. Limit-switch automatic stopping is available on the hand-loaded models in conjunction with the push-button start and stop circuits. The electronic control panel in the cabinet of all models is actuated by either the push-button station or the limit switch, or both.

Circle Item 145 on postcard, page 243

Bliss Die-Tryout Press

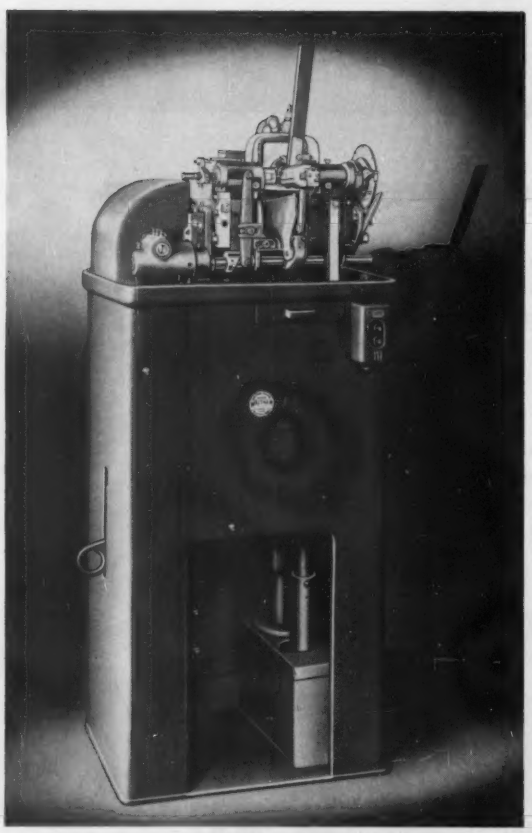
The E. W. Bliss Co., Canton, Ohio, has announced a press for die-tryout and pilot production runs which is designed to combine the best features of hydraulic action and gap-frame construction. A major feature of the hydraulic action is its precise control over inching, which permits close observation of the die action and makes the full tonnage capacity available at any point in the stroke. The stroke itself is longer than that for standard Bliss inclinable presses and compensates for die space and press set-up adjustments, which facilitates die tryouts and pilot runs.

Frames conform to standard Bliss inclinable press specifications, including arrangements for inclining. All models are built to receive standard press accessories and Bliss-Marquette die cushions, and are available in capacities ranging from 50 to 250 tons.

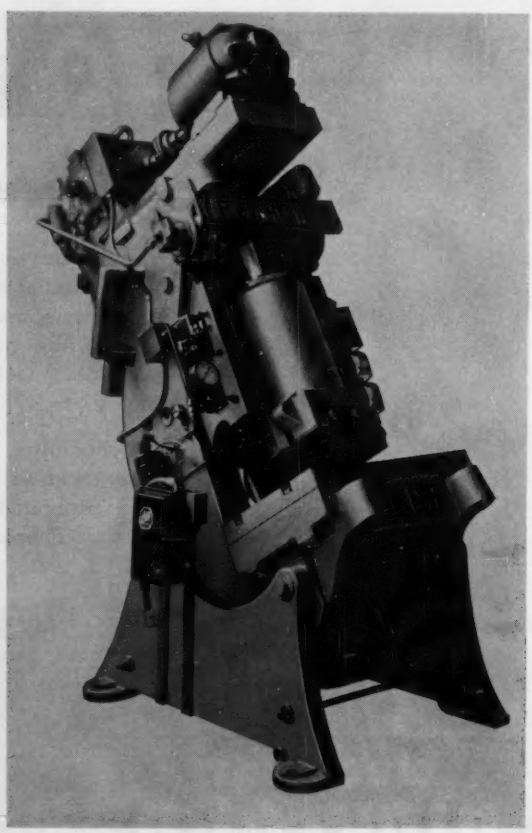
Circle Item 146 on postcard, page 243

Rockwell Valve Lubricant

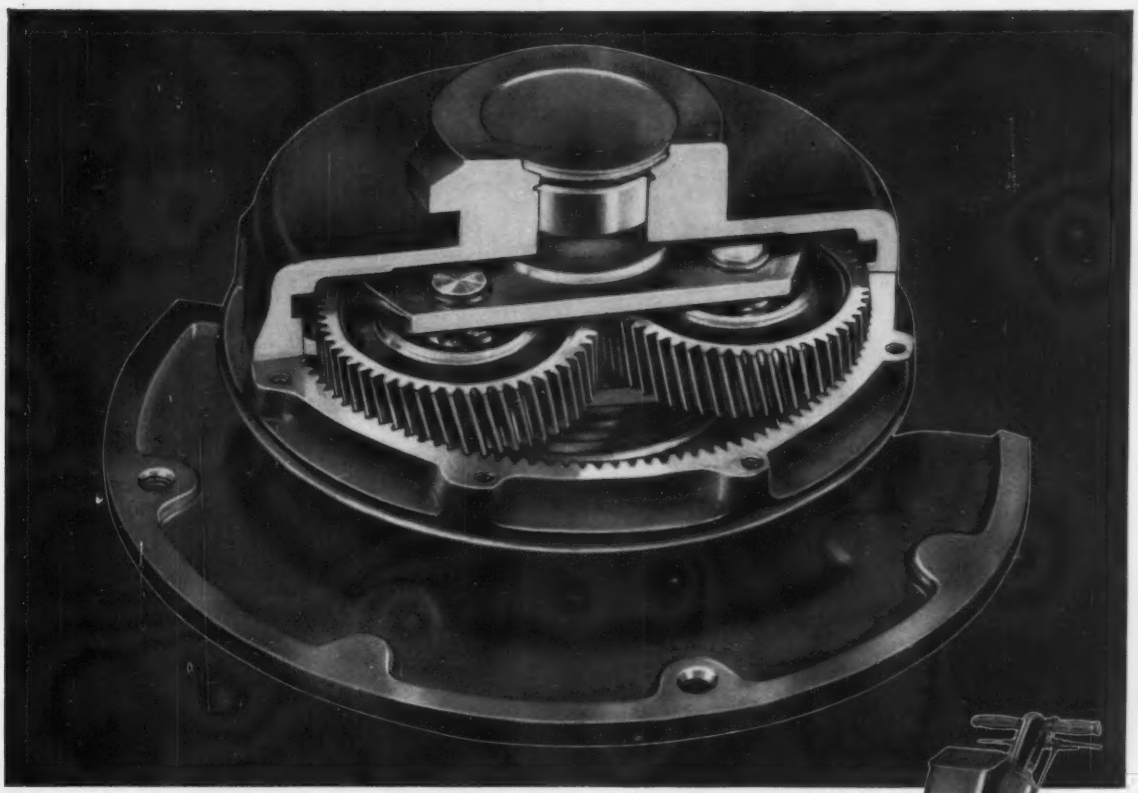
A multi-purpose valve lubricant which can be used under a wide range of temperatures has been introduced by the Rockwell Mfg. Co., Pittsburgh, Pa. This product, the result of extensive research and field testing, is known as the new Rockwell-Nordstrom No. 555 lubricant. It offers good metal-wetting qualities at both sub-zero



Waltham pinion- and gear-cutting machine of improved cabinet model



Press for die-tryout and pilot production runs brought out by E. W. Bliss Co.



Superbly Machined G. S. Planetary Gearing Transmits Power in Clarke Floor Maintainers

Clarke Floor Maintainers take a terrible beating! Buildings use them night after night for years, with little or no down-time. Big contributor to the spectacular power, speed and low operating cost of this rugged machine is the Planetary Gearing *superbly machined* by G. S. ★ If you have power transmission problems in which Small Gearing is involved, check up *now* on *"G. S. Free Consulting Service"*. Let our specialists recommend the ONE best application for the job you describe. Write today!

SEND FOR.. *our 6-page Small Gearing Guide. It illustrates and describes over 80 different types and applications of G. S. Small Gears, from 8 to 96 dp. Ask for it on company letterhead, please.*

40 Years of Specializing in Small Gearing!

FRACTIONAL HORSEPOWER GEARS

GEAR Specialties, Inc.

Spurs · Spirals · Helicals · Bevels · Internals · Worm Gearing · Racks · Thread Grinding

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MEMBER OF

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

and highly elevated temperatures and is unusually resistant to mixtures of hydrocarbons in both acid and alkaline solutions. It will completely replace Nos. 542, 546, 548 and 654 lubricants of the Rockwell-Nordstrom line, and has an "efficient temperature range" of from 40 degrees below to 500 degrees above zero in bulk form and 20 degrees below to 500 above zero in stick form, and is especially recommended for application to valves used in the hydrocarbon liquid and gas services.

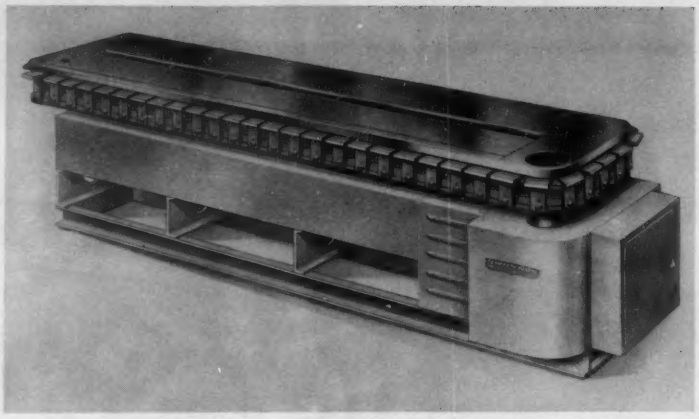
Circle Item 147 on postcard, page 243

Gear-Tooth Space Comparator

A gear-tooth space comparator which automatically checks tooth-to-tooth spacing around a gear or similar work-piece was demonstrated at the Machine Tool Show by the Illinois Tool Works, Chicago, Ill. Operating with a dual finger check, and powered with a unique mechanical arrangement, the machine permits checking the gear while it is in motion. This action, combined with a chart recording, reveals an accurate picture of the tooth spacing quality. By analyzing and interpreting the recordings it is possible to determine the accumulated spacing and maximum out-of-position errors of the teeth.

Circle Item 148 on postcard, page 243

Gear-tooth space comparator introduced by Illinois Tool Works



Swanson Auto-Tran transfer indexing unit for automation applications

Swanson Auto-Tran Indexing Unit

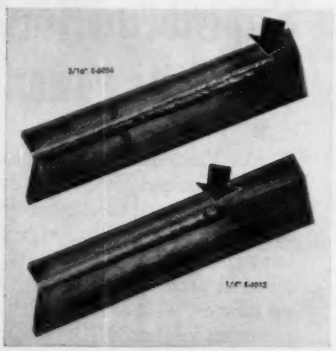
A straight line transfer type machine chassis developed to serve as a basic unit for automation applications is being built by Swanson Tool & Machine Products, Inc., Erie, Pa. This unit known as the "Auto-Tran" is available in a wide range of standard models. It is adaptable to both automatic and semi-automatic assembly work and is designed with accessible faces for mounting various types of equipment for performing such operations as drilling, tapping, and staking. Ample area is also available for mounting hopper feeders in any position around the chassis.

The unit is available with 48 to 72 carriers; 3-, 6-, 9- or 12-inch index travel; and with either vertical or horizontal mounting surfaces on the carriers. Work carriers, attached to a double-roller chain, have ball bearings mounted in both horizontal and vertical planes. These bearings are guided in tracks mounted on the chassis frame. The cam-indexing unit drives a sprocket incorporating a pin type clutch for easy disengagement to facilitate alignment of operational devices and tooling. An electric clutch brake, with standard motor drive, provides complete flexibility.

Circle Item 149 on postcard, page 243

"Sureweld" Iron-Powder Electrodes

Iron-powder electrodes especially designed for high-speed production welding of lap, fillet, and flat-bevelled joints known as "Sureweld," have been brought out by the National Cylinder Gas Co., Chicago, Ill. These electrodes are said to cost less to use and to provide up to 25 per cent faster welding than the E-6012 and E-6020 electrodes of the next larger size used at higher currents. They are also said to produce welds with higher impact values, greater crack resistance, and deeper penetration than the larger size electrodes. Fillet welds have flat contours that permit better stress distribution and stronger joints.



Welds made with "Sureweld" iron-powder electrodes

Two types of the new iron-powder electrodes are available. Sureweld "24" (AWS Type E-6024) is for horizontal fillets, lap, and flat-bevelled joints now welded with E-6012 electrodes, and Sureweld "27" (AWS Type E-6027) is for operations now welded with E-6020 electrodes. Both types work equally well with alternating or direct current.

Circle Item 150 on postcard, page 243

(This section continued on page 248)

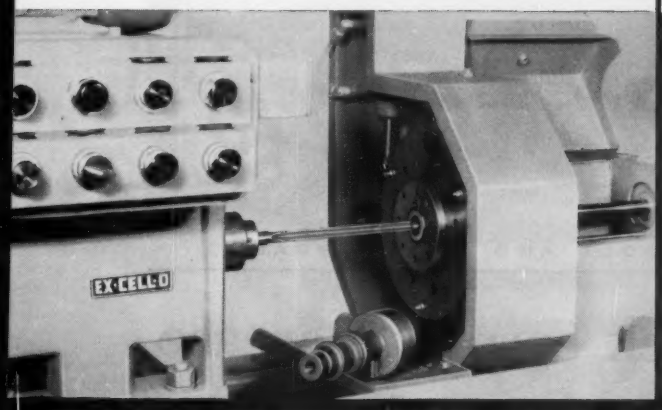


Photo with guards removed shows drill about to enter the guide bushing in the center of the chuck. Coolant oil under high pressure is directed through the spindle and drill, washing chips out of the single flute.

On this cast-iron distributor base, holes are machined straight and round within .0005"; diameter is also held within .0005"; finish does not exceed 15 rms. The hole is completed from start to finish in 30 seconds.

XLO
EX-CELL-O for PRECISION

Today's method by EX-CELL-O for reducing your costs

BOR-DRIL

for straight, accurate holes from solid with good finish—on standard machines

Equipped to Bor-Dril is this standard Style 2112-B the smallest single-end model in the Ex-Cell-O Precision Boring Machine line. These machines are rigid, have easily adjustable feeds, vibration-free spindles. Multiple spindle applications for high production.

For more information on Bor-Dril, or for a quotation on a machine equipped for this work, call in your local Ex-Cell-O Representative or contact Ex-Cell-O in Detroit.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

55-4B

R B&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

Coarse Threads Better Than Fine For Many Jobs

The load and stress concentrations on threads are lower in standard coarse thread fasteners than in fine threaded ones. Flank engagement is also greater because coarse threads are deeper. Except in such cases where fine adjustments are needed, coarse threads are, therefore, preferable to fine threads. They have greater resistance to stripping and, consequently, can be more highly torqued to make a stronger assembly.

PRODUCTION SAVINGS

Coarse thread fasteners tighten with only two-thirds the revolutions needed for fine threads. So your assembly time is faster, too. Coarse thread bolts enter nuts or mating holes with less tendency to cross thread when not truly positioned. In hard-to-reach areas, this ease of starting can often be your deciding factor. Bear in mind, too, that coarse threads need less "babying" in handling since they're less apt to be damaged.

All in all, coarse threaded standard fasteners prove best for an assembly because of their additional clamping strength—and best for the assembler because of their extra economy and production advantages.

Spin-Lock screws increase holding power by 20%

EXPERIENCE confirms that Spin-Lock screws hold tight under conditions of vibration or repeated heating and cooling. Their strong teeth have a ratchet action on the bearing surface—the acute angle lets the screw tighten fast and easily, until the teeth actually embed into the seat upon tightening, as shown in the sectional photomacrograph below. The almost vertical face of the teeth then resists counter-rotation and loosening. As a result, it takes about 20% more torque to loosen a Spin-Lock than to tighten it.

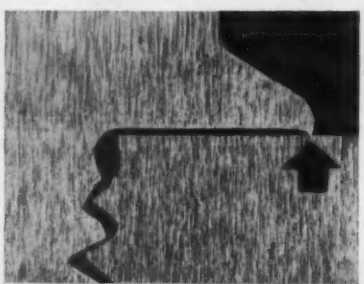
LOWER COST ASSEMBLY

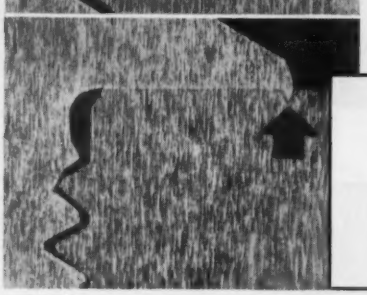
Spin-Lock screws avoid need for washers or external locking devices. One-piece construction, they allow faster assembly and can be easily handled and driven in cramped spaces.

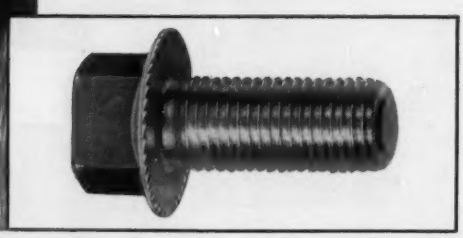
STRONGER ASSEMBLY

Heat treatment gives the teeth hardness and toughness. Spin-Lock screws can, therefore, be reused when removed with but slight loss in holding power. The extra strength also permits tighter fastening for a stronger assembly without risk of stripping threads.

Screws with hex, pan, truss and flat heads are available. See Sweet's Product Designers file or write Russell, Burdsall & Ward Bolt and Nut Company. Plants at: Port Chester, N.Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.







High strength bolts improved product at a saving

A mechanical vibrating shaker naturally suffers severe abuse itself from vibration. One manufacturer of such machines used costly special fasteners and lock nuts to control tendency of the product to loosen up.

Asked about it, RB&W recommended a standard high strength bolt, heavy nut, and two hardened washers. These permitted a high tensile clamping force to be developed. Residual tension was ample for the most severe operating conditions and kept the bolts tight. Result: A 25% saving in annual fastener cost, the constant availability of standard items, and less maintenance for the product. You too can draw on RB&W experience for technical help to assure a strong assembly and to cut costs.

For more information on products advertised, use Inquiry Card, page 243

PRODUCT INFORMATION SERVICE

Use postage-free Business Reply Cards for further information
On New Catalogues described in this issue of MACHINERY
On products mentioned in the editorial pages
On products shown in the advertisements

NEW CATALOGUES

PREVENTION OF OCCUPATIONAL SKIN DISEASES—Association of American Soap & Glycerine Producers Inc., 295 Madison Ave., New York 17, N. Y. 42-page booklet discussing skin diseases most common in industry, causes, and preventive measures. Purpose of the booklet is to promote industrial cleanliness in order to reduce skin diseases. Through its 152 member companies, the Association is planning to distribute the booklet to all those concerned with health and safety in every type of industry. Bulk quantities will be supplied at cost and are obtainable through member companies. Individual free copies may be obtained direct from the Cleanliness Bureau of the Association at the above address.

HYDRAULIC PUMPS AND CONTROLS—Vickers Incorporated, Detroit, Mich. 56-page bulletin describing the company's complete line of oil-hydraulic pumps, controls, and accessories for general industrial applications. The new catalogue includes engineering, design, and application information relating to pumps, pressure controls, volume controls, directional controls, control assemblies, hydraulic motors, transmissions, cylinders, and hydraulic accessories. Each category includes descriptions of the various units which make up that group. Each unit is described in detail with a photograph, cut-away view, and typical circuit drawings explaining the operation and giving application recommendations 1

THREADING EQUIPMENT—Landis Machine Co., Waynesboro, Pa. 28-page booklet describing threading operations to be performed on Landis equipment and describing the new Lanhyrol thread-rolling machine; infeed thread rolling of motor shafts, worm shafts, aircraft bolts, and worm actuators; thrufeed rolling of worm thread; and continuous thread rolling of double-end studs. Also covered are cutting threads on micrometer spindles, valve stems, vise screws, socket head capscrews, close nipples, square-head bolts, and set-screws. A section is also included on attachments, collapsible taps, die-heads, and tangential chasers used in all die-heads. 2

SLITTING LINES—Yoder Co., Cleveland, Ohio. Catalogue containing 76 pages of information on basic considerations in the choice and operation of slitting line including analysis of the slitting cycle with time studies for different speeds; coil sizes and weights; operating cost and savings possible by use of special equipment for loading and unloading coils after slitting and banding; slitting narrow strands; protecting highly finished strip in slitting; and relative advantages of small versus large cylinders, and small versus large coils. 3

STAINLESS STEEL—Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. 10-page booklet entitled "AM 350, A Chromium-Nickel-Molybdenum Stainless Steel Hardenable by Subzero Cooling or Double Aging." The new steel bridges the gap between the 300 and 400 series and was developed primarily for use by aircraft manufacturers. Tables on mechanical properties, stress rupture properties, elevated temperature tensile properties, corrosion rates in various media, and effects of cold-rolling and aging on hardness and tensile properties of AM 350 are included. 4

POWER PRESSES—Famco Machine Co., Kenosha, Wis. 12-page catalogue featuring the company's line of power presses. The four clutch types available are described and illustrated as well as a number of precision-engineered parts that are used in the presses. There are fifty models in the line, ranging in size from 4 tons to 18 tons in both bench and floor models. Complete specifications are given for each model. Also space has been devoted to die space dimensions and information on how to figure press tonnage requirements. 5

STAINLESS STEEL—Alloy Metal Wire Division, H. K. Porter Co., Inc., Prospect Park, Pa. 40-page handbook covering in detail the properties, specifications, applications, and design data on the Division's twenty grades of stainless-steel wire, rod, and strip. Other sections of the book present useful information on workability, cleaning, machinability, and other techniques and practices. Properties charts, size and weight charts, and other tabular data are included. 6

FEATHER VALVE COMPRESSORS—Worthington Corporation, Harrison, N. J. Bulletin L-676-B1A, containing 32 pages on fourteen major advantages of installation, operation, and maintenance costs outlined for Types YC and DYC Feather valve compressors. A 2-page diagram illustrates correct selection and coordination of all auxiliary equipment used in a typical installation, and various photographs show actual compressor installations. 7

GEAR MAKING—Sier-Bath Gear & Pump Co., Inc., North Bergen, N. J. 44 page lithographed brochure giving a portrayal of gear making in commemoration of the 50th anniversary of the company. The booklet illustrates the principal types of gears and miscellaneous combinations, describes the modern methods and techniques for extreme accuracy, and explains the newest trends. 8

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ENGINEERING DATA BOOK—Cooper Alloy Corporation, Hillside, N. J. 16-page stainless-steel engineering data book, including design and dimensional information on flange drilling templates, flange and ring-joint facings, stainless-steel pipe, pipe threads, thread engagement; pressure-temperature ratings and conversion factors, resistance of fluid flow; metal-casting factors; hardness conversion tables; and a detailed materials selection chart covering more than 300 corrosive solutions. **9**

MACHINING ALUMINUM — Kaiser Aluminum & Chemical Sales, Inc., Chicago, Ill., 52-page booklet giving technical data and tooling information on the production of aluminum parts on automatic screw machines. Specific details are given on the various types, on machining speeds and feeds, and cutting fluids. There is extensive use of drawings and illustrations showing proper tool angles for machining various alloys suitable for screw machines. **10**

SEAMLESS STAINLESS TUBING AND PIPING—Tubular Products Division of Babcock & Wilcox Co., Beaver Falls, Pa. Bulletin TB-355 containing 6 pages covering the use of stainless tubing and piping, and touching briefly on the attributes of stainless steel and how it can be fabricated. Also included are tables of analyses, mechanical properties, creep strength, physical properties, and oxidation resistance of nine of the most popular stainless tubing steels. **11**

SPECIALTY STEELS—Carpenter Steel Co., Reading, Pa. 32-page illustrated booklet defining characteristics of a broad range of special-purpose steels in terms of end uses. It briefly summarizes the company's specialty product lines. Corollary information is also given on the quality control necessary in the manufacture of specialty steels. The guide is intended to help match the proper steel to the job, and thus improve tooling, fabrication, and product performance. . **12**

HEAT-TREATMENT—Lindberg Engineering Co., Chicago, Ill. 24-page booklet entitled "How to Plan Your Toolroom Heat-Treating Department," which gives information on how to select furnaces of proper size, approximate floor space requirements, and listing auxiliary equipment such as tongs, straightening presses, work benches, and hardness testers. A practical guide to assist those planning new, enlarged, or redesigned heat-treating departments. **13**

CARBIDE INSERTS—Viking Tool Co., Shelton, Conn. 6-page bulletin No. 55, containing full information on the six sizes and eleven styles now available of the company's Dexomatic "Chiptrol" tooling for both light- and medium-duty machining applications with triangular and square throw-away carbide inserts. Also described are negative as well as positive rake angles. A carbide grade selector guide is included. **14**

METAL-CHILLING AND PRODUCT-TESTING EQUIPMENT—Cincinnati Sub-Zero Products, Cincinnati, Ohio. Bulletin 102, containing 12 pages which illustrate seven models of chilling machines and four models of industrial temperature-testing units. Specifications and complete descriptions for each unit are furnished, as well as technical data concerning the application to industrial processes. . . **15**

FRICTION CLUTCH—Link-Belt Co., Chicago, Ill. Catalogue 2637, containing data on an improved friction clutch for power transmission applications. The clutch is available in three types—mounting sleeve, mounting ring, and coupling. Besides describing how the clutch operates, the booklet gives horsepower and dimension tables, and full instructions for choosing the correct clutch for a given application. **16**

HONING MACHINES—Sunnen Products Co., St. Louis, Mo. Form X-MAN-5000F, containing 8 pages on honing machines and their application for production, tool-room, salvage, and maintenance. The booklet explains honing, compares it with other metal-working methods; and tells where and how honing can best be used. Exclusive machine features are discussed and the principle of honing is described and illustrated. **17**

ROLLER BEARINGS—Dodge Mfg. Corporation, Mishawaka, Ind. Bulletin A-638, containing 52 pages of up-to-date technical information and list prices on the complete line of Dodge SC ball and Dodge-Timken roller bearings. Tabular data includes engineering drawings, dimensions, shaft sizes, weights, and radial load ratings. There are also product illustrations, including cut-away views of inner construction. **18**

AIR FILTERS AND LUBRICATORS—Master Pneumatic, Inc., Detroit, Mich. Catalogue containing 20 pages and giving comprehensive listings of many sizes and types of air filters and lubricators. It describes how new methods of filtration lengthen air-tool life and reduce repair considerably. Installation and maintenance are covered in detail, and a dimension sheet and parts list are included. **19**

ROTARY FILE—Grobet File Co. of America, New York City. 16-page rotary file catalogue for hard and soft metals, plastics, wood, and other materials. Fully illustrated with all files shown actual size, catalogue includes chisel-cut, ground-from-the-sold, and tungsten-carbide rotary files, as well as countersinks and rasps in a wide range of sizes, shapes, and cuts. **20**

WHEEL DRESSERS—J&S Tool Co., Inc., Livingston, N. J. Booklet describing the company's "Fluidmotion" line of wheel dressers. Fully illustrated, the literature describes the procedure for forming wheels to shape on internal, cylindrical, and surface grinders, and tool and cutter grinders. Complete specifications for all models of the dresser are provided, along with operating instructions. **21**

SPRING DESIGN DATA SHEETS—Hunter Spring Co., Lansdale, Pa. 8-page engineering study giving the basic considerations in designing precision springs. Line drawings, graphs, and formulas are used to illustrate various types of springs, and a graphical description of low-deflection characteristics and the eight ways to specify compression and extension springs are presented. **22**

FRICTION MATERIALS — Caterpillar Tractor Co., Peoria, Ill. Publication DE588, containing 8 pages of friction facts. A question and answer method is used to explain the company's testing and research program by which the proper qualities in clutch facings and

Product Information Service

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brake linings are obtained. Pictures are included which range from initial screening of materials to final tests in the field. **23**

COUPLINGS—Dodge Mfg. Corporation, Mishawaka, Ind. Bulletin A-640, describing Flexidyne for dry fluid drive and its operating advantages, including uniform performance regardless of temperature, long life, negligence maintenance, compactness, easy selection, and easy torque adjustment when installed. Full color illustrations and dimensional drawings are included. **24**

TOOL STEELS—Crucible Steel Company of America, Pittsburgh, Pa. 44-page booklet entitled "Tool Steels" including six basic classifications for the nonmetallurgist. Properties of the various types of tool steels are discussed and general recommendations are made as to which type of application is most suitable to each classification. Heat-treating technique is also covered, plus tables **25**

ELECTRODE SELECTOR GUIDE—Alloy Rods Co., York, Pa. Bulletin AR-10, containing 4 pages on the selector guide which gives Arcaloy designations, electrode data, and application data for twenty-two of the stainless-steel electrodes in the Arcaloy line. Other sections of the bulletin cover coating identification information and a table of current ranges for stainless welding. **26**

GRINDING MACHINE CENTERS—Ready Tool Co., Bridgeport, Conn. Catalogue G-550-1, introducing two new anti-friction super-accurate centers, as well as the line of solid centers for grinding machines. A chart for correct selection of center taper specifications is included to help machinists choose the correct centers needed for specific work on particular machines. **27**

GEARS—Detroit Bevel Gear Co., Detroit, Mich. 8-page brochure showing detailed information on the company's complete gear and axle shaft lines, which include spur, helical, spiral, bevel, hypoid, straight bevel, Zerol, flywheel ring gears, and spline shafts. Each gear is discussed in terms of the available equipment to produce it—from engineering to final inspection. **28**

CONTROL MOTORS—Transicoil Corporation, Worcester, Montgomery County, Pa. Bulletin offering complete availability data on gear train-control motor combinations which meet difficult space and performance requirements. Numerous servo control ideas are also presented as used in servo assemblies that have been custom-designed and manufactured to solve particular problems. **29**

ROD PARTERS—O'Neil-Irwin Mfg. Co., Lake City, Minn. 14-page manual illustrating the Di-Acro rod parter and explaining how it cuts round, square, rectangular, and hexagon bar stock without rough edges or burr. Specifications in capacities on both hand- and power-operated Di-Acro rod parters are said to be listed in table form for easy reference. **30**

VACUUM MELTING—Carboloy Department of General Electric Co., Detroit, Mich. Bulletin VM-101, containing 23 pages covering the effects of vacuum melting on properties of various metallic materials. It also includes detailed engineering data on two new vacuum melted high-temperature alloys, M-252 and J-1570, now in commercial production. **31**

PRELUBRICATED BEARINGS—Reliance Electric & Engineering Co., Cleveland, Ohio. Bulletin A-2406, describing prelubricated bearings. Additional features which are covered include the complete bearing sealing enclosure to protect against foreign matter, a large grease reservoir to insure adequate lubrication, and precision mounting for extra performance. **32**

GRINDING WHEELS—Sterling Grinding Wheel Co., Tiffin, Ohio, 30-page catalogue giving specifications and prices on grinding wheels, plate-mounted wheels, segmental wheels, Easymount wheels, mounted wheels and points, nut inserted discs, and segmental and Easymount chucks. Illustrations and specifications are included. **33**

HANDY DATA FILE—Mac-it Division, Strong, Carlisle & Hammond Co., Cleveland, Ohio. Data file containing information on seven types of socket screw keys with regard to dimensions, standard sizes, physical properties, recommended tightening torque, and suggested applications and uses. **34**

WELDING EQUIPMENT—Air Reduction Sales Co., New York City. 16-page catalogue featuring the company's inert-gas-shielded arc-welding process. Manual and automatic units along with accessory apparatus and welding wire are described in the illustrated booklet. Models, specifications, and illustrations are included. **35**

SURFACE GRINDERS—Thompson Grinder Co., Springfield, Ohio. Catalogue D55, containing 5 pages describing the Type D Thompson surface grinder which is the latest addition to the company's line of small super-precision surface grinders. All details are clearly illustrated in color and complete drawings and specifications are provided. **36**

ROTARY MACHINES—Niagara Machine & Tool Works, Buffalo, N. Y. Bulletin 75-B, containing 24 pages listing the extensive line of hand- and power-operated rotary machines, rolls, and accessories of the company. An illustrated

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selection chart showing various job parts is included for simple selection of machines and rolls. 37

DRILLING MACHINES — Cincinnati Lathe & Tool Co., Cincinnati, Ohio. Catalogue D-134, describing the 16-inch drilling machines with new electrical controls, depth dial, easy speed change, direct-drive, and full-floating spindle. Specifications, dimensions, and illustrations are included. 38

MAGNETIC TAPE MACHINE CONTROL—Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. Bulletin NR-1, describing the company's Numericord system of machine tool automation for production of intricately contoured, close-tolerance work-pieces of multi-axis machines, completely controlled by magnetic tape. 39

INDUSTRIAL GREASES—Sinclair Refining Co., New York City. Bulletin detailing qualities and specifications of multiple-purpose industrial greases. Advantages are discussed such as prevention of lubrication or misapplication, simplified maintenance procedures, and reduction in required manpower. 40

UTILITY PRESS—Producto Machine Co., Bridgeport, Conn. Bulletin TE4-101, containing 4 pages and illustrating and describing the No. 2 utility press which combines the valuable features of screw, ram, and power press in one machine. Design and construction features, application data, and specifications are included. 41

CARBIDE TOOL-HOLDERS — Wendt-Sonis Co., Hannibal, Mo. Bulletin MTH-55, containing 4 pages on the company's tool-holders and throw-away carbide inserts. Dimensions and prices are given on five different style tool-holders with shanks down to 1/2 inch square, as well as on inserts, chip breakers, and replacement parts. 42

COMPARATIVE REAMER SELECTOR—Lavallee & Ide, Inc., Chicopee, Mass. 20-page booklet which gives complete dimensional data on all standard reamers, blanks, and cutters. The selector also includes style and net price information, plus the newly enlarged list of company's reamer sets. 43

VAPOR DEGREASING MACHINES—Baron Industries, Los Angeles, Calif. Leaflet describing the company's line of metal cleaning machines available in gas, steam, or electrically heated models to suit any installation requirement. Specifications and illustrations are included. 44

SHAPED TUBING—Superior Tube Co., Norristown, Pa. Data Memorandum No. 17, illustrating and describing shaped tubing and step-tapered tubing. Complete information is given on analyses available, tool charges, size range, commercial tolerances, lengths, temper, and how to order. 45

SALT-BATH FURNACES—Hevi Duty Electric Co., Milwaukee, Wis. Bulletin 655, describing immersed electrode salt-bath furnaces for small tool-rooms as well as large production plants. Engineering data, specifications, construction, and advantages are given. 46

PANTOGRAPH MILLING MACHINES—Johnson & Bassett, Inc., Worcester, Mass. 6-page leaflet describing, illustrating, and giving engineering specifications of Model 3A Panto-Miller, a tracer-controlled production machine for three-dimensional pantograph and milling work. 47

GASKET - MOUNTED HYDRAULIC VALVES—Petch Mfg. Co., Detroit, Mich. Bulletin H55, giving complete engineering data and specifications on the Hupp threadless sub-plate for gasket-mounted hydraulic valves. Illustrations, specifications, and diagrams are included. . . 48

REINFORCED PLASTIC TOOLING—Marblette Corporation, New York City. 20-page publication entitled "A Manual for Reinforced Plastic Tooling," based on actual tool and die-shop experience. The text, photos, drawings, and charts provide much step-by-step working information. 49

PRODUCTION CONTROL — American Non-Gran Bronze Co., Berwyn, Pa. Leaflet describing a service of contract machining parts to Nth degree precision under statistical quality control methods. Advantages of this method for better production control are explained. . . 50

ENGINE LATHES—Stokvis-Edera & Co., Port Washington, N. Y. 16-page brochure describing Demoor engine lathes. Complete details are given, including close-up views of various components and explanation of controls and specifications for ten models in the line. 51

AIR PRESSURE—Ross Operating Valve Co., Detroit, Mich. 8-page publication called "The Ross EnginAIR," which gives the latest developments in the fast growing field of pneumatics. This is the first issue of the new publication which will be published every other month. . . . 52

WORM-GEAR SPEED REDUCERS—Cleveland Worm & Gear Co., Cleveland, Ohio, 7-page brochure describing worm-gear speed reducers and built-in worm-gear drives that are made in types and sizes to meet most every industrial power transmission requirement. . . . 53

CARBIDE BLANKS—Carboloy Department of General Electric Co., Detroit, Mich. Publication GT-292, covering carbide blanks for clamp-on style tools, solid carbide on-end inserts, round and square inserts, and triangular and square throw-away insert blanks. 54

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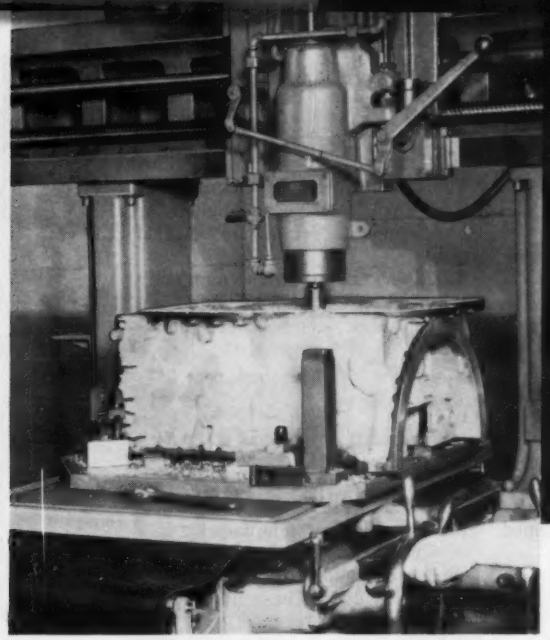


If limits are measured in .0001ths

chances are

Fafnir has a bearing on it

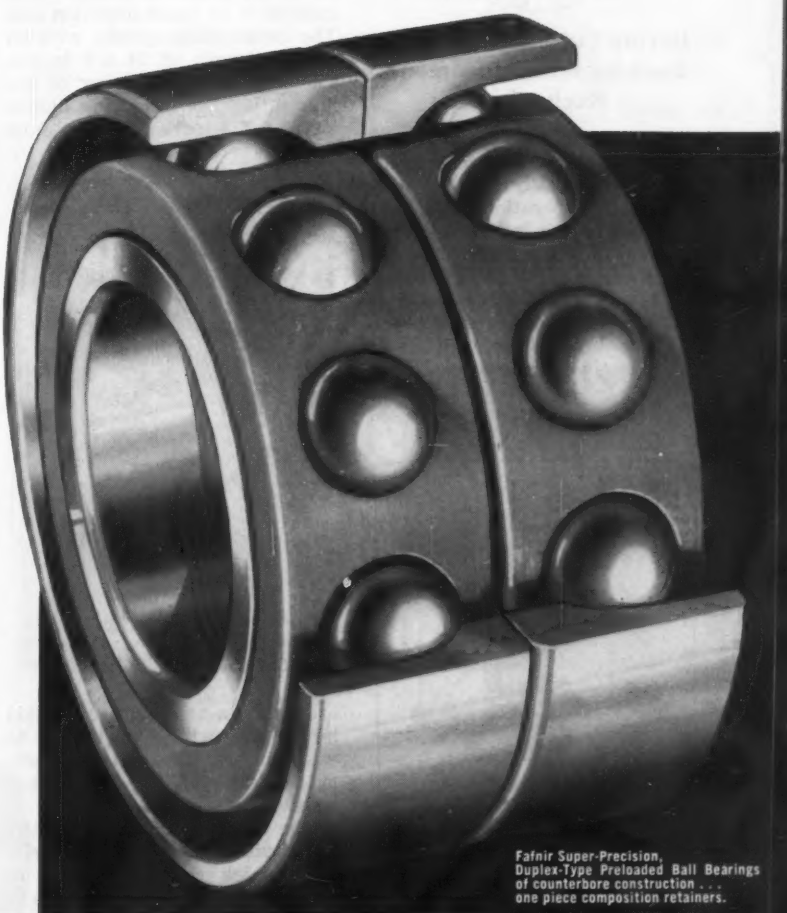
Precision designing and construction of the spindle head illustrated make possible extremely accurate profiling or milling at twelve operating speeds ranging from 260 to 6200 rpm. Design specifications include four pairs of Fafnir Super Precision Ball Bearings on the spindle shaft. These "jewels of industry" provide the ultimate in axial and radial rigidity. They run cool under exacting conditions of load and speed . . . conserve power . . . need no adjustment . . . and are permanently grease-packed.

It's in places like this where limits are in .0001ths that you find Fafnir Super-Precision Bearings . . . because they are *manufactured* in a separate super-precision department to the highest standards of dimensional control . . . in a wide range of sizes and types. There could be no better example of the "attitude and aptitude" of Fafnir engineers toward solving bearing problems.

If bearings are important to you, a few minutes spent with a Fafnir representative may help you get the right answer quickly.

The Fafnir Bearing Company,
New Britain, Connecticut.

MOST COMPLETE LINE IN AMERICA



Fafnir Super-Precision, Duplex-Type Preloaded Ball Bearings of counterbore construction . . . one piece composition retainers.

FAFNIR BALL BEARINGS

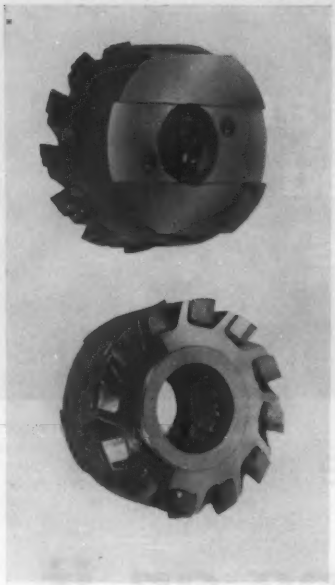


Fig. 1. Rear and front views of Ingersoll boring cutter

Boring Cutter with Blade-Locking and Adjustment Mechanisms

An inserted-blade boring cutter with blade-locking and adjustment mechanisms totally enclosed during cutting operations has been developed by the Ingersoll Milling Machine Co., Rockford, Ill.

The new cutter is being used for rough-boring cast-iron automobile cylinder blocks, and is expected to find a variety of other applications in production boring of cast iron. Locking mechanisms on the front of the boring cutter are enclosed by the flange of the hold-in screw which seats against the front hub of the cutter. On the back of the cutter, adjusting screws for setting out blades are enclosed in the tapered bore of the cutter which fits snugly against the tapered pilot of the spindle.

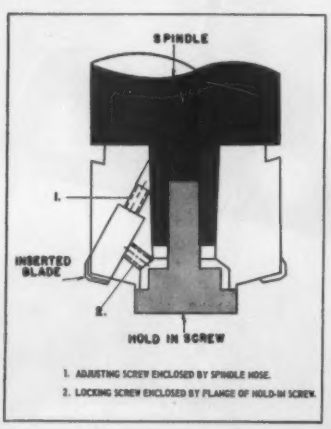


Fig. 2. Diagram showing how adjustment mechanisms of cutter shown in Fig. 1 are completely enclosed

The locking and adjusting mechanisms are readily accessible when the cutter is not mounted on the spindle. The design of this boring tool makes it possible to increase the number of blades in small-diameter cutters. The number is determined by the feed rate, chip load and bore size and may vary from six to twelve carbide-tipped blades per cutter.

Circle Item 151 on postcard, page 243

Super-Precision Grinding Wheel Spindles

The Standard Electrical Tool Co., Cincinnati, Ohio, has just added three new grinding wheel spindles to its super-precision line. The Series 2513 spindle with an over-all length of 24 5/8 inches, shown in the lower view of the illustration has a housing diameter of 6 5/8 inches. Similar units

Grinding wheel spindles added to super-precision line made by the Standard Electric Tool Co.

are made in smaller sizes and in larger sizes with diameters up to 8 3/4 inches. The optional shaft-lock accessory *L* is for use when removing the wheel holder.

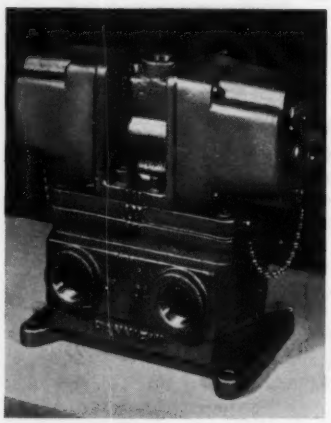
The spindles shown in the two upper views are from the Series 4200 which covers a range of wheel sizes from 8 to 60 inches in diameter, powered by motors from 1/2 H.P. to 50 H.P. A spindle having a tapered nose at each end is illustrated in the upper view. This same Series 4200 spindle is shown with sheave and balancing type wheel holder in the central view.

These spindles are dynamically balanced, assembled, and tested in a dust-humidity-temperature-sound-controlled department.

Circle Item 152 on postcard, page 243

Hannifin Solenoid Heads for "Pilot-Master" Valves

The Hannifin Corporation, Des Plaines, Ill., has announced a line of solenoid heads for its "P-M" three-way and four-way "Pilot-Master" valves. These heads have been designed to meet the new J. I. C. electrical recommendation that air cylinder control valves be developed that would be electri-

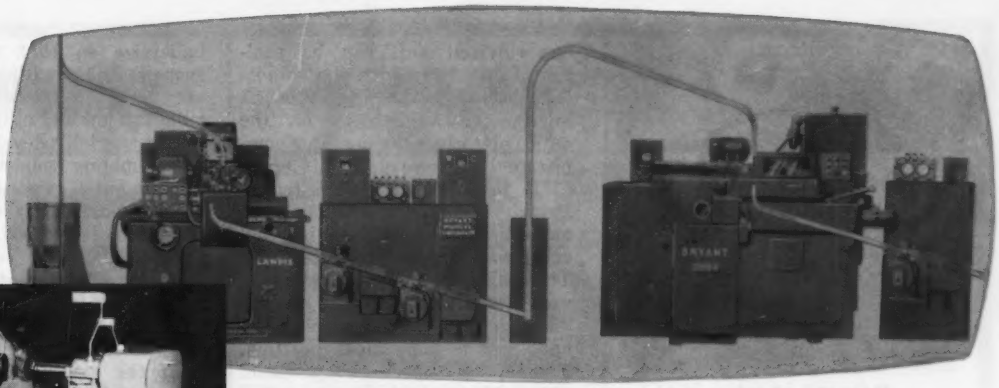


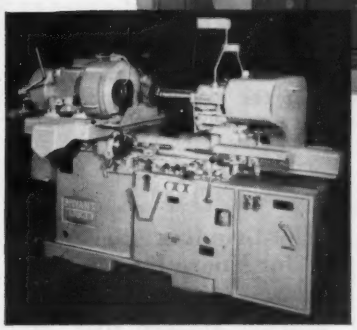
Hannifin momentary contact, four-way "Pilot-Master" valve with dust-tight, splash-proof solenoid covers

cally inoperative if a maintenance man should remove a solenoid cover and fail to replace it. The solenoid covers are die-cast of zinc alloy and made splash-proof and dust-tight by gaskets.

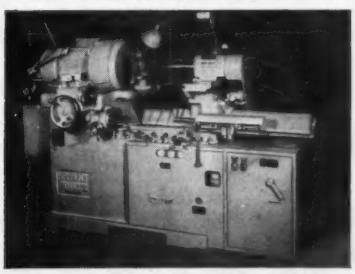
At the end of each cover is a manual operating button which can be actuated by a small screwdriver or even with a pencil to operate the valve without removing the cover. Both the three-way and the four-way valves are made in all standard pipe sizes from 3/8 inch to 1 1/2 inches. Both single- and double-solenoid (momentary contact) models are available in both series.

Circle Item 153 on postcard, page 243

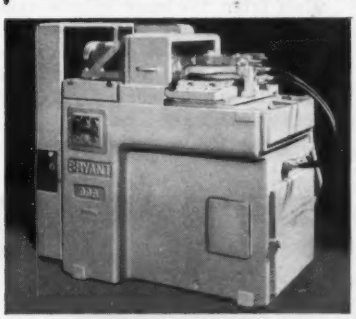




plus *Combined bore and face grinding.* 1316-J Bryant performs two or more operations at a single chucking. Two wheelheads on a single wheelslide provide exceptional speed, accuracy and versatility.



plus *Extreme accuracy and fine finishes.* The 1116-X features an extra fine cross feed. Designed for ease in grinding to close tolerances of size, out of roundness and finish.



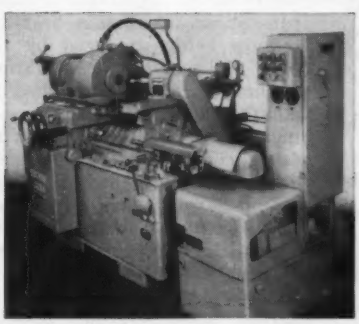
plus *Uniform fine finishes, utmost accuracy* and peak production on the Bryant 998 Precision Boring Machine . . . in precision boring, drilling, turning, facing, grooving, contour boring and turning.

Equally Suited to Toolroom or High Volume Production

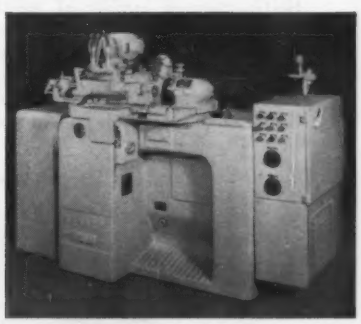
Whether your main interest lies primarily in tool room production, or in automated production lines, you will be interested in what Bryant has to offer.

A complete line of internal grinders, incorporating the exclusive Bryant alignment features, is available. These machines can be equipped with such cost-cutting features as Bryant air sizing, for extremely accurate sizing, shoe centerless grinding, and the Bryant Process Controller, for automatic sizing control.

Free literature on Bryant machines and methods available on request.



plus *Constant production in bore grinding.* The 3216 Bryant Automatic features automatic cycling for high production precision grinding.



plus *High production grinding of small bores.* Control of this Bryant 1209-Y with the Bryant Process Controller provides automatic statistical quality control.

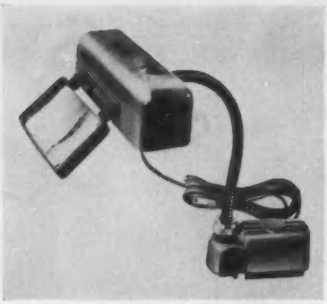
BRYANT

chucking grinder co.

20 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates



Portable Light with Magnetic Base

Fluorescent light with a magnetic base designed for industrial laboratories, tool-rooms, die shops, machine shops and for bench inspection work. This unit, called the "Handi-Lite," has two 5-inch fluorescent lamps that give high intensity lighting at the normal working distance. A plastic chip shield protects the lamps from damage. An improved instant starter switch is located on the hood. The heavy-duty, flexible gooseneck permits directing the light where desired. Also available with a four-power magnifier for precision inspection, set-up and lay-out work. Product of the Lufkin Rule Co., Saginaw, Mich.

Circle Item 154 on postcard, page 243

Universal Vertical Head for Horizontal Machines

Self-contained universal vertical head designed to convert horizontal machines to all-angle vertical mills, announced by the Rotex Punch Co., Inc., San Leandro, Calif. This independent, five-speed, motor-driven unit can be positioned angularly with the spindle lever-locked in any position. A micrometer adjustment on the quill front gives the operator complete cutting measurements up to 0.001 inch over a 2-inch travel. Primary job measurements can be made by the use of a sliding dial attached to the quill handle shaft. The quill handle incorporates a rack-and-pinion lock that may be disengaged to permit placing the handle in a convenient position. Five spindle speeds range from 390 to 5200 R.P.M. Standard "Y" type collets are available from 3/16 to 1/2 inch.

Circle Item 155 on postcard, page 243

Thin-Section Instrument Bearings

Thin-section instrument bearings are now being produced by the Split Ballbearing Corporation, Lebanon, N. H. The method of manufacturing these bearings is unique, and results in a bearing with a complete ball complement without a loading notch. Bearings thus made also have the advantages of high-load capacity and longer life. The manufacturing method also allows construction of integral shields as a part of the bearing, something not possible with conventional methods.

The bearing is made in bore sizes ranging from 0.6250 inch to 3.1245 inches. Construction variations are offered which include one-piece synthetic retainers; full ball complement; alternate undersize ball complement; or either of the latter two with integral shielding. The alternate ball series is especially interesting in that alternate balls are slightly undersize so that they act as spacers. The resulting bearing has very low and constant torque values at low and moderate speeds.

The specially developed method of assembling consists of fracturing the outer race of the bearing at one point by an exclusive patented process. Special tools then spread the race sufficiently to allow introduction of proper components—in the case of the full ball complement type the balls are introduced through the opening.

In the retainer type, holding rings prevent the fracture from re-opening.

Circle Item 156 on postcard, page 243

Slot-Grinding Attachment for Moore Jig Grinder

Horizontal-spindle slot-grinder attachment available from Moore Special Tool Co., Inc., Bridgeport, Conn., for use on this company's No. 2 jig grinder. This attachment can be substituted for the vertical-spindle grinding head to perform such operations as grinding enclosed contours, including sharp corners, keyslots, and other forms. Although the horizontal spindle axis is nominally aligned with the travel of the out-feed slide, its rotatable mounting permits positioning in any other desired angular relationship. A slide arrangement provides for axial adjustment of the wheel position, so that it can be set radial to, or offset from, the main spindle axis. This adjustment is necessary in centralizing angles dressed on the wheel face, and for dressing a wheel to grind a centrally located slot in the bore of a hole.

Circle Item 157 on postcard, page 243

WHAT	WHERE	WHY
SUNVIS 900	**In tight systems** where oil is rarely changed and little or no make-up is needed.	**Exceptionally long life** of oil keeps overall costs low.
SOLNUS	**In tight systems** where make-up oil is less than 5% per month.	**Moderately priced**...excellent stability and rust protection.
SUNTAC	**In leaky systems** where make-up average is 5% or over per month.	**Reduced leakage** in systems cuts oil costs and downtime.
CIRCO	**In systems** where oil is continuously diluted by water, cutting fluids and other contaminants.	**Low-priced**...excellent protection where oil must be changed frequently.
SUNVIS H.D. 700	**In systems contaminated** by dust and deposits of sludge, varnish, etc.	**Cleansing action** removes deposits and eliminates costly teardowns.
LUBEWAY	**In dual purpose systems** of machine tools where hydraulic oil is also a way lubricant.	**Added film strength** of this hydraulic oil also eliminates "stick-slip" on ways.

CHART SHOWS WHERE AND WHY SUN HYDRAULIC OILS SAVE MONEY

As the chart shows, to operate your hydraulic system at maximum efficiency and minimum cost you must consider the condition of your hydraulic system, as well as pressures, operating temperatures and other usual factors.

And, very important, you must consider the age of your system. Continued use of original oil recommendations can be costly. A change in the type of oil can often result in substantial savings...especially where systems have developed leaks or where sludge and varnish cause excessive maintenance.

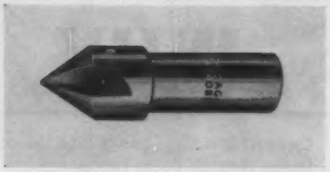
For complete information about how Sun hydraulic oils can help you cut operating costs of your hydraulic system, see your Sun representative...or write SUN OIL COMPANY, Philadelphia 3, Pa. Dept. M-10.

SUNOCO®

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL



Chicago-Latrobe High-Speed Countersinks

High-speed countersink or center reamer available in a complete range of sizes from Chicago-Latrobe, Chicago, Ill. In addition to either high-speed or carbon steel countersinks with included angles of 60 and 82 degrees, these tools are also available in high-speed steels with included angles of 90, 100, 110, and 120 degrees. Sizes varying in steps of 1/8 inch range from 1/4 to 3/4 inch in diameter, inclusive.

Circle Item 158 on postcard, page 243

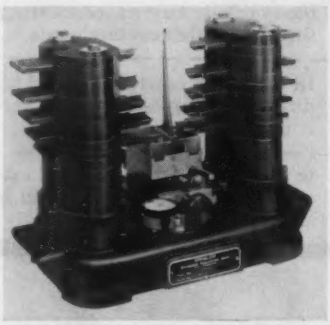
"Stur-D-Aire" Amplifier for Air Gage

The Sturdy Tool & Gage Co., Detroit, Mich., has announced the "Stur-D-Aire" amplifier here illustrated. This new back-pressure type air comparator can be used to vary the amplification to suit moderate production runs of precision parts, or the instrument can be set to a predetermined magnification with no change of parts. It can be used in combination with improved techniques for salvaging air-gage spindles, making it unnecessary to discard or throw away worn spindles.

Circle Item 159 on postcard, page 243

Winslow Guillotine Gage with Interchangeable Parts

Guillotine gage placed on the market by Winslow Mfg. Co., Cleveland, Ohio. This gage is a patented device assembled from precision-built stock components. It is already being used in the aircraft engine industry for precision airfoil inspection of jet-engine blades. The gage checks both the forging and the finished part by merely substituting a different holding fixture. Each gage can be supplied to check up to ten different features of a blade

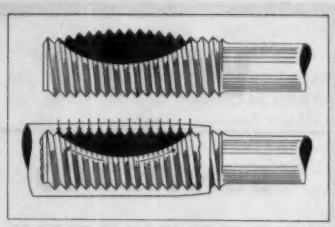


and, if originally furnished to check only part of the list, can easily be converted at a later date.

Circle Item 160 on postcard, page 243

Starloc Self-Locking Threads for Aircraft Turnbuckles

Self-locking male threads of aircraft turnbuckles, special bolts and screws now being manufactured by Starloc, Inc., New York City, to meet military specifications. The Starloc screw thread is designed to eliminate the need for safety wiring, cotter-pins, lockwashers, lock-nuts, jam fits, staked bolts, and similar components. A special feature of the locking screw is the wide range of adjustment permitted with positive locking torque. The threads remain distortion-free and permit repeated removal and replacement of the threaded part without loss of adequate locking torque and without galling of the threads. The Starloc thread fits standard nuts, and the locking feature can be added to any type of standard screw form for custom threaded applications. The locking action is achieved by a convex fiber insert in the thread of the bolt so



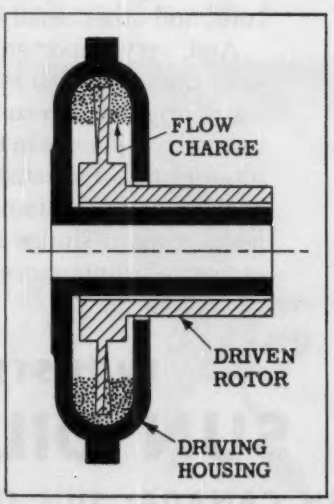
formed as to permit easy insertion and at the same time insure locking action along the entire length of insert against the nut.

Circle Item 161 on postcard, page 243

Dodge "Flexidyne" Dry-Fluid Drive

New development in industrial power transmission, called "Flexidyne" and described as a dry-fluid drive, announced by Dodge Mfg. Corporation, Mishawaka, Ind. Based upon a completely new principle, this drive is said to perform easily difficult starting and reversing jobs, and to give a new kind of protection against shock and overloads. The major advantages claimed for this dry-fluid type drive are based on the fact that at normal operating speeds it does not slip. At the same time, in the case of a definite overload, it provides protection by permitting slippage. This drive, originated in Europe, has been redesigned by the Dodge Mfg. Corporation to suit American requirements and is available from stock in sizes rated at 3 to 30 H.P. at 1800 R.P.M. It is claimed to have wide application for drives involving heavy inertia and shock loads.

Circle Item 162 on postcard, page 243



No. 50 Sunnen Honing Machines
SUNNEN Portable Hones
No. 51 Sunnen Portable Cylinder Hones
NEW MANDREL SETS for TOOL ROOMS
No. 55 Sunnen Tool Room Honing
STONES MANDRELS and ACCESSORIES for the SUNNEN PRECISION HONING MACHINES
SUNNEN
No. 505 Sunnen Honing Supplies & Accessories
SUNNEN External Hone
No. 58 Sunnen External Hones
TYPICAL APPLICATIONS
105 Case Histories
SUNNEN HONING MACHINES
No. 60 Sunnen Honing Case Histories

These 6 FREE BOOKLETS show how

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Between Grinds

By E. S. Salichs

Apple Saucer?

A Southern newspaper published an interview with a local photographer who believes in flying saucers and advances an unusual interpretation of them. He thinks they are spaceships from other solar systems on exploratory missions. And he says, "Some of the mysterious disappearances of history may have been these visitors taking earth-people home with them. This does not necessarily mean that they are unfriendly. Remember, Columbus took several Indians back to Spain with him, after discovering America." Get me my wampum belt, I'm going out for a midnight stroll.

Bray-vo

In the summertime, technical literature isn't the only kind to hold our attention. Which is merely to preface something we read about Grand Cayman Island in the Caribbean. Seems there is a head tax on "all males and donkeys between the ages of sixteen and sixty." The difficulty, according to the authorities, is that "from all we can find out, all donkeys on the island are either under sixteen or over sixty because we do not get much income from that source."

Delighted to Delete It

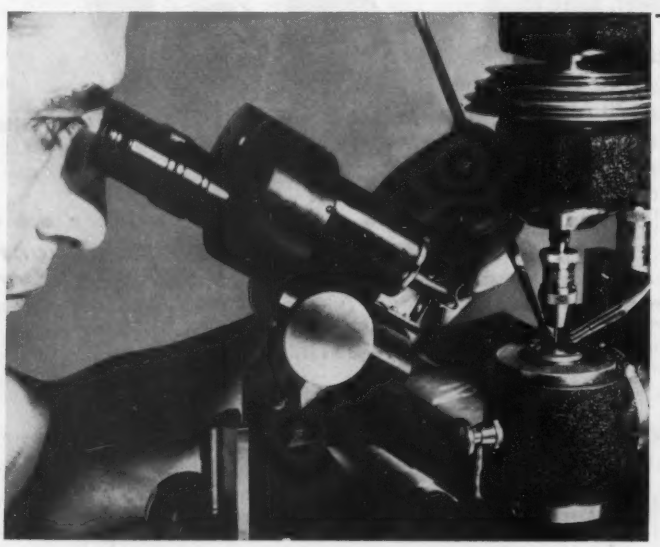
One of MACHINERY's associate editors used the word *foolproof* while editing a manuscript on a pneumatic drill jig. The author of the contribution objected, suggesting the word be changed on the grounds that "There is no foolproof thing as long as we have fools." Since Webster has plenty of other words, it would be foolhardy to stir up any discussion on this particular one.

For Thinking Caps

A research coordinator, surprised to learn that the automotive industry uses milk bottle caps (during painting operations), wants to know what other industries might possibly make use of the paper caps in any phase of their manufacturing or processing operations.

A Long Ranger

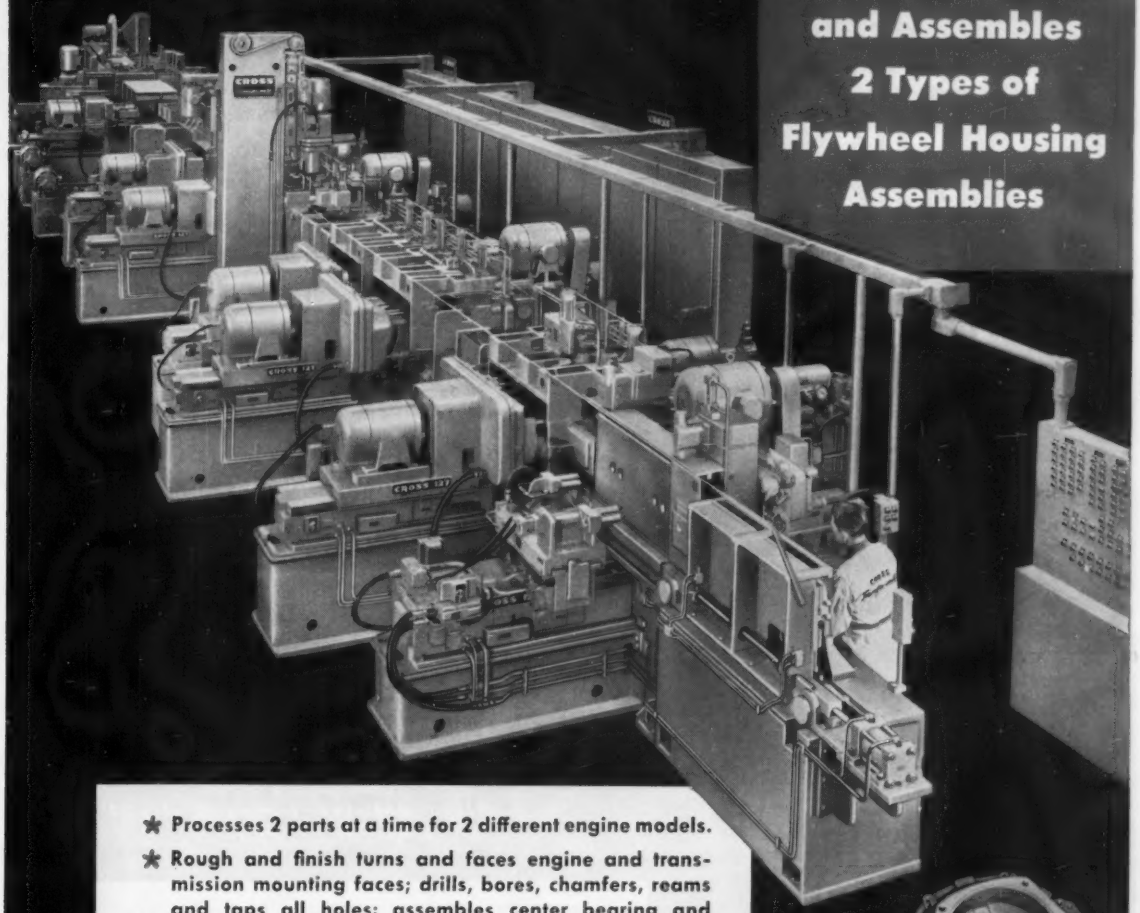
Upon receiving a check for his shop kink type of article "Slide with Automatic Reversal and Adjustable Stroke," Stanley P. Gould, of Porterville, Calif., graciously wrote to the Editor, saying: "It reminds me of old times, as forty or forty-five years ago you published some of my contributions. I saw MACHINERY grow, having been a constant reader since 1898." A long time between kinks, Mr.Gould.



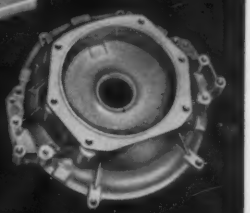
HAIR-SPLITTING STORY — If you could spare a hair from your head, and some can't, this drill will drill it full of holes, which can then be threaded with 0.001-inch wire. The drill, too small to be seen by the human eye and so delicate that it would be damaged by contact with a paper tissue, has the strength to pierce hard metal. With the help of a microscope, the General Electric instrument maker seen here is brushing away minute chips. The drill is used at the General Engineering Laboratory for drilling fuel nozzles, leak orifices, and X-ray apertures.

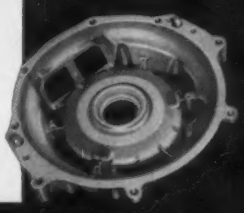
Another Transfer-matic by Cross

Bores, Faces, Drills and Assembles 2 Types of Flywheel Housing Assemblies



- ★ Processes 2 parts at a time for 2 different engine models.
- ★ Rough and finish turns and faces engine and transmission mounting faces; drills, bores, chamfers, reams and taps all holes; assembles center bearing and 2 dowels; finish bores and inspects center bearing after assembly; washes, dries parts for final assembly.
- ★ 314 pieces per hour at 100% efficiency.
- ★ 20 stations: 1 loading; 10 machining; 2 assembling; 4 inspecting; 2 cleaning; 1 unloading.
- ★ Pre-set tools to reduce downtime for tool changing.
- ★ Complete interchangeability of all standard and special parts for easy maintenance.
- ★ Other features: Construction to J.I.C. standards; hydraulic feed and rapid traverse; hardened and ground ways; automatic lubrication.





Established 1898

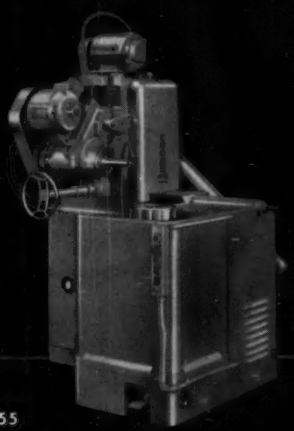
THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

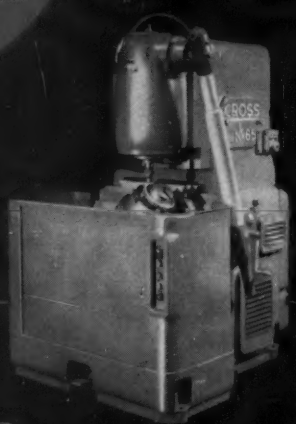
Greater Flexibility with Cross Gear Machines

for rounding • chamfering • pointing • burring



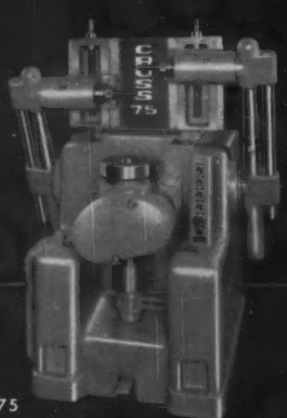
NO. 55

For rounding, pointing, chamfering or burring external and internal—
spur gears • helical gears
clutches • splines
Typical production—rounding or pointing 8 pitch 30 tooth gears—55 net hourly.



NO. 65

For pointing or chamfering external and internal—
clutches • spur gears
bevel gears • splines
Typical production—pointing 10 pitch 30 tooth gears—100 net hourly.



NO. 75

For burring or chamfering both ends at the same time—
helical gears • spiral bevel pinions
hypoid pinions
Typical production—chamfering 8 pitch 40 tooth gears—200 net hourly.

- ★ **Flexibility for handling a wide variety of gears.**
- ★ **Rugged, heavy duty construction for continuous high production or job shop operation.**
- ★ **Short setup time (as little as 15 minutes) for changing from one gear to another.**
- ★ **Simple, inexpensive tooling.**
- ★ **Push button controlled automatic cycle.**
- ★ **Hydraulic power work clamping.**

For mass production or short run jobbing operations, there is a Cross Gear Machine to suit your requirements.

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

For more information on products advertised, use Inquiry Card, page 243

News OF THE INDUSTRY

California, Texas and Arizona

VLIER ENGINEERING CO., Los Angeles, Calif., manufacturer of tool accessories, recently moved into a new 12,500 square foot building located on the southwest corner of Santa Monica and San Vicente Blvds. in Los Angeles. The founder and present owner and president, BLAINE H. VLIER, started the company twelve years ago. Mr. Vlier selected the site for the new building that has 9350 square feet devoted to office and manufacturing areas.

UNION TWIST DRILL CO., Athol, Mass., announces that it has taken over the operation and management of its entire West Coast operations which were formerly under the direction of the E. B. Sutton Co. Direct factory offices and warehouses will be continued to be located in Los Angeles, San Francisco, and Seattle.

The FORD INSTRUMENT CO., Division of Sperry Rand Corporation, New York City, has just opened an office at 260 S. Beverly Drive, Beverly Hills, Calif. EDWARD F. MANION will be in charge of the West Coast office. Ford's standard line will be continued to be handled by JOSPEH F. SODARO Co., Culver City, Calif.

ABE HAGLUND has been made sales manager of the Milling Machine Division of Axelson Mfg. Co., Los Angeles, Calif. Mr. Haglund started with Axelson in 1911 as a machinist and later became works manager and company delegate to Europe and South America.

JOSEPH BURCH, JR., has been named West Coast gage sales engineer for Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn. He will make his headquarters in the Los Angeles, Calif., office.

KLEM CHEMICALS, INC., Dearborn, Mich., announces the opening of a new plant at 1905 N. Central Ave., El Monte, Calif. JACK BORKMAN has been appointed general manager.

ROY C. HEACOCK has been made director of engineering for Axelson Mfg. Co., Division of U. S. Industries, Inc., Los Angeles, Calif.

PRATT & WHITNEY Division Niles-Bement-Pond Co., West Hartford, Conn., has appointed the SOUTHWEST INDUSTRIAL SALES CO., Dallas, Tex., as its representative in the north Texas area.

JOHN C. MULLARKEY has been appointed by Oakite Products, Inc., New York City, to be its technical service representative in Phoenix, Ariz.

Indiana, Kentucky, and Missouri

CLARK & OSBORNE CO., 6325 Guilford Ave., Indianapolis, Ind., has been appointed by Jones & Lamson Machine Co., Springfield, Vt., as sales representative covering most of the state of Indiana.

BIDDLE SCREW PRODUCTS CO., Sheridan, Ind., has announced the completion of a plant expansion program in Sheridan. which involved more than $25,000,000.

RUSSEL T. LUND has been appointed vice-president of the National Carbide Co., a Division of Air Reduction Co., Inc., New York City. His headquarters will be in Calvert City, Ky., which is the home of the company's new calcium carbide and acetylene generating plant.

HYDRA-FEED MACHINE TOOL CO., Ferndale, Mich., has appointed BLACKMAN & NEUTZEL MACHINERY Co., 3713 Washington, St. Louis, Mo., to handle its automatic and tracer lathes in the South Central States. Their territory will include southern Illinois, Missouri, Oklahoma, and Kansas.

Michigan, Wisconsin, and Illinois

UDYLITE CORPORATION, Detroit, Mich., has announced an expansion and building program. A plant is being erected on the twenty-three acres on which all of the company's Detroit, Mich., facilities will be located in the near future. A new warehouse and office in New York and in Chicago is in the process of construction.

THE CROSS COMPANY, Detroit, Mich., builder of automation machinery, is beginning construction of a $4,000,000 factory and office building on a sixty-five-acre site on 14 Mile Road and Grosbeck Highway, Detroit, Mich. The new plant will feature radiation resistance construction materials.

BAKER BROTHERS, INC., Toledo, Ohio, has opened a combination sales and engineering division in the Detroit, Mich., area. The new office is headed by JOHN P. NUGENT, divisional sales manager, and is located at 15414 W. Warren, Dearborn, Mich.

EARL J. PETERS has been appointed general sales manager of Ace Drill Corporation, Adrian, Mich.

RAYMOND F. STEVENS has joined the Acheson Colloids Co., Port Huron, Mich., as a research chemist.

ALLIED METAL TREATING CORPORATION, Milwaukee, Wis., announces acquisition of the facilities of Wesley Heat Treating Co., Manitowoc; and Wesley Metal Treating Co., Spindler Metal Processing Co., and Capitol Heat Treating Co., Inc.—all of Racine. CHARLES I. WESLEY has been made president of the enlarged corporation.

PAUL O. WERNICKE has been named sales manager of the Machine Tool Division of Mercury Engineering Corporation, Milwaukee, Wis. This division specializes in the de-

Paul O. Wernicke, sales manager of the Machine Tool Division, Mercury Engineering Corporation

sign and manufacture of special machine tools—particularly foundry and precision grinding equipment.

GIDDINGS & LEWIS MACHINE TOOL Co., Fond du Lac, Wis., has acquired the Cincinnati Bickford Tool Co., Cincinnati, Ohio, and the Kaukauna Machine Corporation, Kaukauna, Wis. Both companies will continue operations at their present locations, but as divisions of the parent company.

VERNON D. ENWALD has been made midwest regional manager for the Warner Electric Brake & Clutch Co., Beloit, Wis.

John B. Kendall, manager of Ford Motor Co.'s Chicago stamping plant

JOHN B. KENDALL has been named manager of the Ford Motor Co.'s new Chicago, Ill., stamping plant. Mr. Kendall formerly was manager of the company's Buffalo stamping plant. He is succeeded in that position by F. J. BUSHROE.

GENERAL ELECTRIC Co., Pittsfield, Mass., has announced the appointment of K. O. WILLIAM SANDBERG as manager of the custom-molding plant of the Plastics Department, Decatur, Ill.

New England

LOVEJOY TOOL Co., Springfield, Vt., announces the appointment of the following new agents: F. A. VERRILLO, DeWitt, N. Y. for Syracuse and central New York State; PEARSE-DENGEL TOOL Co., Hasbrouck Heights, N. J., for New York City, Long Island, and northern New Jersey; JACK D. URBAN, Cleveland, Ohio, for north central Ohio and Cleveland; PRENTISS CLEAVES Co., San Diego, Calif., for San Diego County, Calif.; WALLACE Co., INC., Houston, Tex., for Texas; REID TOOL SERVICE, Charlotte, N. C., for North and South Carolina; and FRANK PLIMPTON, Springfield, Vt., for Vermont and New Hampshire.

FEDERAL PRODUCTS CORPORATION, Providence, R. I., has increased its manufacturing space 24,000 square feet by the occupancy of a building on Oxford St. in Providence.

Carles Roby, president of the Heald Machine Co.

CINCINNATI MILLING MACHINE Co., Cincinnati, Ohio, announced that the plant of the HEALD MACHINE Co., Worcester, Mass., has been acquired by a subsidiary of the Cincinnati company. Heald products will continue to be built and sold by the Heald Machine Co. with RICHARD A. HEALD as board chairman and CARLES ROBY as president. Mr. Roby has been a vice-president and director of the Cincinnati Milling Machine Co.

BURTON G. EBBESON has been appointed district sales engineer for the New England district of the Norton Co., Worcester, Mass. Mr. Ebbeson has been with Norton since 1936. Two years ago he was made field engineer for the New England territory.

HOWARD V. WILLIAMS has been appointed manager of the advertising department of the New Britain Machine Co., New Britain, Conn.

GEORGE CAGEN has been made chief product engineer of the Lux Clock Mfg. Co., Waterbury, Conn.

ALEXANDER S. KELLER has been made vice-president and director of Niles-Bement-Pond Co., West Hartford, Conn., and general sales manager of the Pratt & Whitney Division. JOSEPH E. LOWES, JR., has been named director of public relations for the company.

Alexander S. Keller, vice-president and director of Niles-Bement-Pond Co., and general sales manager of Pratt & Whitney Division

New York and New Jersey

GENERAL ELECTRIC's Industry Control Department, Schenectady, N. Y., announces the following reassignment of managers: L. R. SPICER has been named manager of sales in Milwaukee, Wis., succeeding L. J. GEIGER, who has been appointed manager of Starter and Accessory Sales. Mr. Geiger moves to the position vacated by A. J. LEE, who becomes manager of Equipment Sales. Mr. Lee replaces R. A. CLIFF, who has been appointed manager for Product Sales for the Michigan User Industries Sales District.

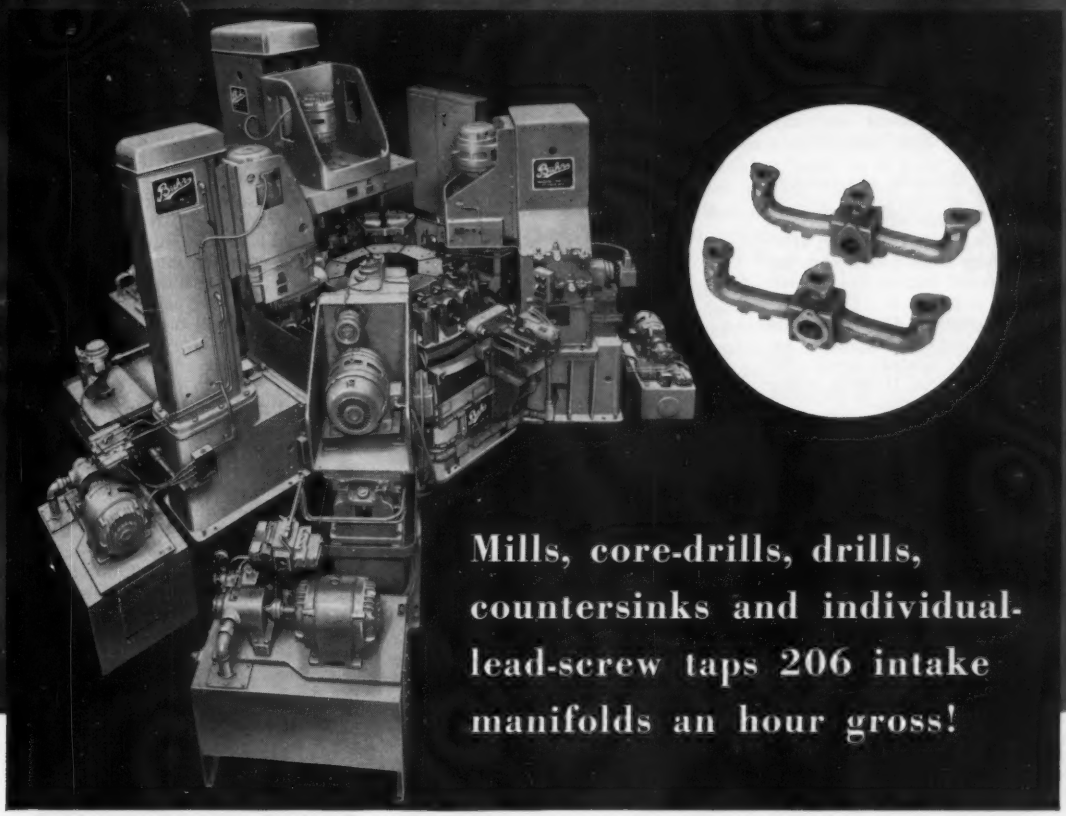
UNION CARBIDE NUCLEAR Co., a division of Union Carbide and Carbon Corporation, New York City, has been formed to integrate the corporation's activities in the atomic energy field. KENNETH RUSH, a vice-president of Union Carbide, has been appointed president of the new company and LYMAN A. BLISS, CLARK E. CENTER, and OSCAR F. HOLMGREN have been named vice-presidents.

BURG TOOL MFG. Co., INC., Gardena, Calif., manufacturer of turret tools, has set up the Burgmaster Eastern Sales Division. BILL MCAVAY, general manager, heads the new office located at 15 W. 44th St., New York City. Mr. McAvay and his staff will service the Greater New York area, New Jersey, and additional territory as facilities permit.

HOMER C. GRAY, JR., has been elected to the board of directors of

ANOTHER EXAMPLE of
REDUCING COSTS WITH—

Buhr ECONOMATION



Mills, core-drills, drills, countersinks and individual-lead-screw taps 206 intake manifolds an hour gross!

Economy and auto*mation* are combined in this Special to form another example of the way Buhr *Economation* reduces production costs for leading manufacturers.

This 6-way dial-type hydraulic-feed Buhr Special is equipped with a 72″-diameter 8-position automatic index table, complete with shot bolt.

Chip disposal is accomplished by an automatic rotating chip conveyor, attached to index.

Operations formerly accomplished by eight machines were combined in this Buhr Special —and volume of production was increased! . . . A typical example of Buhr Economation!

Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

See what Buhr Economation can do to reduce your production costs. A phone call, wire or letter will bring you a prompt consultation with one of our top sales executives.

BUHR MACHINE TOOL CO.©
ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers

the Wales-Strippit Corporation, North Tonawanda, N. Y., and has also been appointed vice-president and director of sales for the corporation. WALTER L. FLANDERS has been appointed works manager, having formerly been production manager.

WALLACE S. FRANK has been appointed supervisor of the process development unit for the General Electric Co.'s silicone products department, Pittsfield, Mass. His headquarters will be in Waterford, N. Y.

The appointment of FREDERICK A. FIELDER as assistant to the general manager of Loewy Construction Co., Inc., New York City, has been announced by the parent company, Hydropress, Inc., New York City.

ARTHUR H. QUIGLEY, chairman of the board of directors, has retired from active service with the American Brass Co., New York City, after more than fifty-three years with the concern.

CARL HIRSCHMANN CO., INC., Manhasset, N. Y., has been appointed exclusive United States agent for A. Stephan & Sons, Hameln/Weser (near Hanover), Germany.

WILLIAM J. FENWICK has been appointed to the position of controller of the Lamson Corporation, Syracuse, N. Y. He joined the company in 1938.

GEORGE L. ABBOTT, president of Garlock Packing Co., Palmyra, N. Y., since 1928, has been elected chairman of the board and chief executive officer. He is succeeded in the presidency by ROBERT M. WAPLES, who was formerly executive vice-president. WILLIAM M. SHEFFELD has been elected to a vice-presidency.

George E. Ellis, general sales manager, Lipe-Rollway Corporation

GEORGE E. ELLIS has been appointed general sales manager of Lipe-Rollway Corporation, Syracuse, N. Y. He will supervise sales promotion activities for the machine tool and automotive-clutch divisions of the company.

JOHN T. ROBINSON has been appointed sales manager of the Products Division of Greer Hydraulics, Inc., New York City.

CARL CLAUS has been named director of staff of the Babcock & Wilcox Co., New York City.

EDWARD L. DREYER has been elected president of Adamas Carbide Corporation, Kenilworth, N. J. He has held the position of executive vice-president and general manager for the past nine years.

Ohio

E. H. HUGHES, manager of the sales order department of the Timken Roller Bearing Co., Canton, Ohio, has been named to the newly created post of assistant to the sales director. His duties include the establishment of a new sales planning department. JOHN RUNDT has been appointed chief engineer of the Division of Research & Development and ALVA KOPATZ has been made chief draftsman for the same division. ROBERT W. WAGENHALS has been named manager of the Sales Forecast Department.

JOHN CAMERON has been named assistant chief engineer, Hamilton Mechanical Presses, of the Hamilton Division, Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio. He was formerly with the Clearing Machine Co., Chicago, Ill. LAWRENCE BIRDSONG has been appointed manager, press service department, having been associated with this division for over thirty-seven years. He will be responsible for all mechanical press service and will also take charge of repair parts sales.

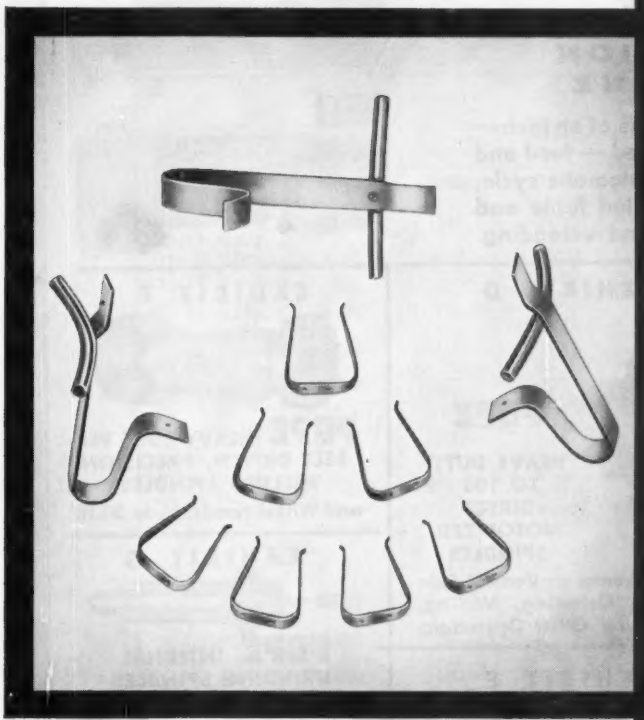
E. W. BLISS CO., Canton, Ohio, announces the following appointments: B. E. MEYER has been appointed to the newly created position of general service manager. From new offices located at the main plant, Mr. Meyer will direct the nationwide operations of the company's preventive maintenance service. CARL J. THEKEN has been made manager of the Die Supply Division with headquarters in Cleveland, Ohio. EDMUND M. BRUMAGIN has recently been appointed sales manager to take charge of the Die Supply Division.

(*This section continued on page* 266)

(Left) George L. Abbott, chairman of the board, Garlock Packing Co., and (right) Robert M. Waples, president

B. E. Meyer, general service manager, E. W. Bliss Co.

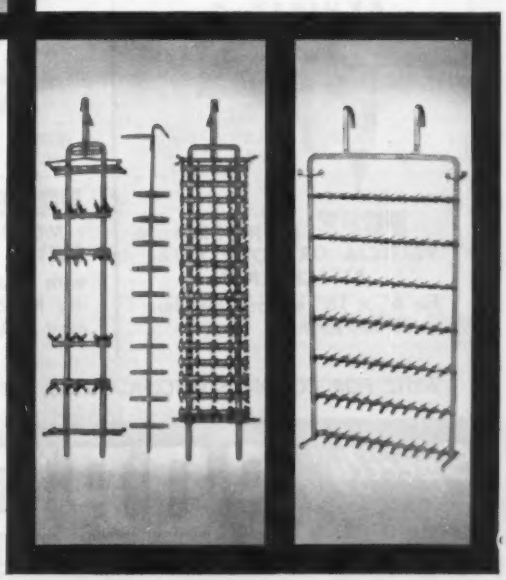
Spring quality of
REVERE
PHOSPHOR BRONZE
—important to Higgins Rack



When small parts have to be plated, the problem arises as to how to hold them on the plating racks. If they are not heavy enough to hang by their own weight, spring clips must be used. For such clips, the Higgins Rack Coating Mfg. Co., Hazel Park, Mich., uses spring temper Revere Phosphor Bronze Strip. This material is specified because its spring temper gives it the ability to withstand repeated flexing, so that the clips can be used repeatedly, and that small parts can be snapped in and out of them quickly and without distortion.

The racks to which these clips are attached are made of copper bar; the clips are fastened by riveting and soldering. Everything except the contact points of the clips is coated to prevent deposition of the plating metal and loss of current. Higgins is an important supplier of these special racks to the automotive industry, which uses them to plate both interior and exterior trim. The efficiency and economy of this method helps make handsomer cars and trucks as well as numerous other attractive consumer commodities.

Clips and racks made to special designs by the Higgins Rack Coating Mfg. Co., which buys Revere Phosphor Bronze Strip for the clips from Copper and Brass Sales, Inc., a Revere Distributor in Detroit, Mich.



REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

* * *

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N.Y.
Sales Offices in Principal Cities, Distributors Everywhere.

O-O-O-OH! WHAT YOU MISSED . . .

if you didn't get to see these

POPE® PRECISION PRODUCTS

at the Machine Tool Show!

EXHIBIT A

The NEW POPE SUPER-PRECISION BORING MACHINE

that bores holes round within millionths of an inch—table actuation all electrically controlled — feed and traverse rates infinitely variable — automatic cycle, including loading if desired — angled table and bridge for extreme ease of loading and unloading.

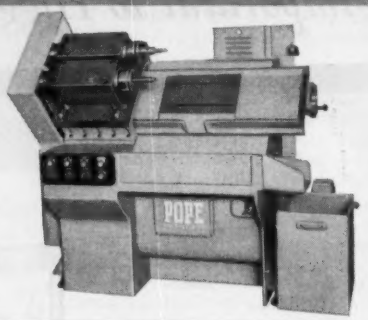
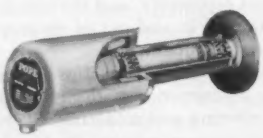
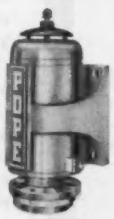


EXHIBIT B



POPE 1 HP, TOTALLY ENCLOSED 3600 RPM MOTORIZED, CARTRIDGE TYPE PRECISION SPINDLES with double row cylindrical roller bearings and separate thrust bearings for *no* endwise movement of the shaft

EXHIBIT D



POPE HEAVY DUTY, ¾ TO 100 HP DIRECT MOTORIZED SPINDLES for Horizontal or Vertical Skin Milling, Grinding, Milling, Boring and Other Operations

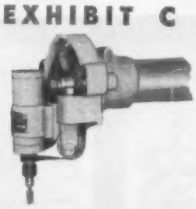
EXHIBIT F

POPE HEAVY DUTY VEE-BELT DRIVEN, PRECISION MILLING SPINDLES, and Wheel Heads, ½ to 50 HP

EXHIBIT G

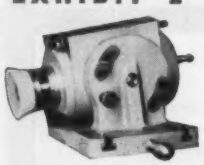
POPE INTERNAL GRINDING SPINDLES for Cincinnati, Norton, Landis and Heald Grinders and Springfield Vertical Grinders

EXHIBIT C



POPE HIGH SPEED VERTICAL OR HORIZONTAL ATTACHMENTS for 6″ x 18″ surface grinders at 15,000 RPM

EXHIBIT E



POPE SUPER-PRECISION MOTORIZED TOOL AND CUTTER GRINDER SPINDLES with clearance Angle Swiveling Heads for *Angular Adjustment In A Vertical Plane*

EXHIBIT H

POPE SUPER-PRECISION HIGH FREQUENCY HEAVY DUTY GRINDING AND MILLING SPINDLES for speeds up to 100,000 RPM

WRITE FOR COMPLETE SPECIFICATIONS, PRICE AND DELIVERY

No. 105

Specify **POPE** PRECISION SPINDLES

POPE MACHINERY CORPORATION
Established 1920
261 RIVER STREET • HAVERHILL, MASSACHUSETTS

For more information on products advertised, use Inquiry Card, page 240

AMERICAN STANDARD KNURLING—7

Table 1. (*Continued*) **Knurling Data for Fractional Blank Diameters, in Inches, Using Standard Diametral Pitch Knurling Tools**

Diametral Pitch		160		128		96		64	
Approximate Depth of Tooth, or Increase in Knurled Diameter		0.009		0.012		0.016		0.024	
Diameter of Blank*		Knurled Diameter	Number of Teeth in Knurled Circumference	Knurled Diameter	Number of Teeth in Knurled Circumference	Knurled Diameter	Number of Teeth in Knurled Circumference	Knurled Diameter	Number of Teeth in Knurled Circumference
5/8	0.625	0.634	100	0.637	80	0.641	60	0.649	40
41/64	0.641	....	...	0.653	82	....	..	0.665	41
21/32	0.656	0.665	105	0.668	84	0.672	63	0.680	42
43/64	0.672	....	...	0.684	86	....	..	0.696	43
11/16	0.688	0.697	110	0.700	88	0.704	66	0.712	44
45/64	0.703	....	...	0.715	90	....	..	0.727	45
23/32	0.719	0.728	115	0.731	92	0.735	69	0.743	46
47/64	0.734	....	...	0.746	94	....	..	0.758	47
3/4	0.750	0.759	120	0.762	96	0.766	72	0.774	48
49/64	0.766	....	...	0.778	98	....	..	0.790	49
25/32	0.781	0.790	125	0.793	100	0.797	75	0.805	50
51/64	0.797	....	...	0.809	102	....	..	0.821	51
13/16	0.812	0.821	130	0.824	104	0.828	78	0.836	52
53/64	0.828	....	...	0.840	106	....	..	0.852	53
27/32	0.844	0.853	135	0.856	108	0.860	81	0.868	54
55/64	0.859	....	...	0.871	110	....	..	0.883	55
7/8	0.875	0.884	140	0.887	112	0.891	84	0.899	56
57/64	0.891	....	...	0.903	114	....	..	0.915	57
29/32	0.906	0.915	145	0.918	116	0.922	87	0.930	58
59/64	0.922	....	...	0.934	118	....	..	0.946	59
15/16	0.938	0.947	150	0.950	120	0.954	90	0.962	60
61/64	0.953	....	...	0.965	122	....	..	0.977	61
31/32	0.969	0.978	155	0.981	124	0.985	93	0.993	62
63/64	0.984	....	...	0.996	126	....	..	1.008	63
1	1.000	1.009	160	1.012	128	1.016	96	1.024	64
Recommended Tolerance on Knurled Outside Diameter	Class 1		+0.002 −0.006		+0.003 −0.008		+0.004 −0.010		+0.005 −0.012
	Class 2		+0.000 −0.006		+0.000 −0.008		+0.000 −0.009		+0.000 −0.010
	Class 3		+0.000 −0.003		+0.000 −0.004		+0.000 −0.005		+0.000 −0.006
Recommended Tolerance on Work Blank Diam. before Knurling	Classes 1 and 2		±0.0005		±0.0010		±0.0015		±0.0020
	Class 3		+0.0000 −0.0005		+0.0000 −0.0010		+0.0000 −0.0015		+0.0000 −0.0020

*Decimal equivalents are rounded off in accordance with American Standard Z25.1—1940. For unlisted diameters refer to formulas in Fig. 4.

Note: Use of 64 diametral pitch knurl should be avoided as much as possible. For simplification of tools it is recommended that preference be given to use of 96 diametral pitch (shown in bold face type).

Extracted from ASA B5.30-1953 with permission of publisher, American Society of Mechanical Engineers

AMERICAN STANDARD KNURLING—8

Table 2. Diagonal and Diamond Knurling Produced by Straight Tooth Cylindrical Knurls

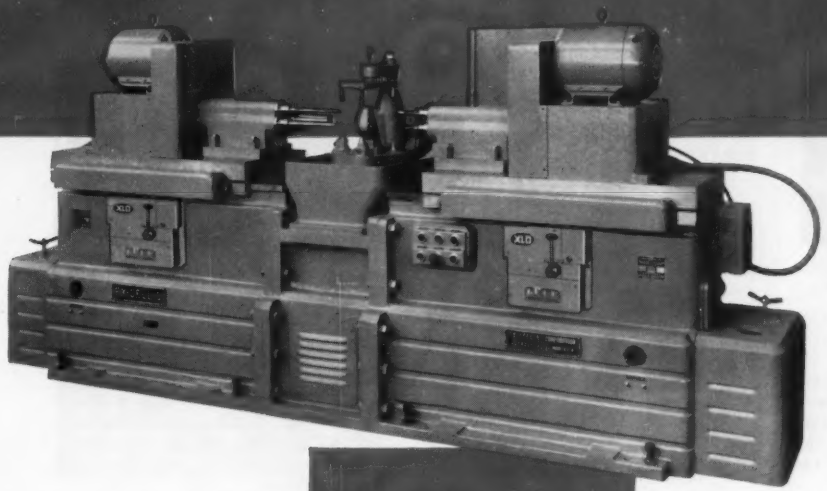
No. of Teeth On Work	Theoretical Blank Diameter on Which Standard Pitch Knurls May be Expected to Track*																			
	Angle Between Axis of Work and Knurl Axis																			
	25 Deg.				30 Deg.				35 Deg.				40 Deg.				45 Deg.			
	64P	96P	128P	160P	64P	96P	128P	160P	64P	96P	128P	160P	64P	96P	128P	160P	64P	96P	128P	160P
15				0.103				0.108				0.114			0.153	0.122			0.166	0.133
16				0.110				0.115			0.153	0.122			0.163	0.130			0.177	0.141
17				0.117			0.153	0.123			0.162	0.130			0.173	0.139			0.188	0.150
18			0.155	0.124			0.162	0.130			0.172	0.137			0.184	0.147	0.398	0.265	0.199	0.159
19			0.164	0.131			0.171	0.137			0.181	0.145			0.194	0.155	0.420	0.280	0.210	0.168
20			0.172	0.138			0.180	0.144			0.191	0.153	0.404	0.272	0.204	0.163	0.442	0.295	0.221	0.177
21			0.181	0.145			0.189	0.152	0.401	0.266	0.200	0.160	0.424	0.286	0.214	0.171	0.464	0.309	0.232	0.186
22			0.190	0.152	0.397	0.265	0.198	0.159	0.420	0.279	0.210	0.168	0.445	0.299	0.224	0.179	0.486	0.324	0.243	0.194
23	0.397	0.264	0.198	0.159	0.415	0.277	0.207	0.166	0.439	0.292	0.219	0.175	0.465	0.313	0.235	0.188	0.508	0.339	0.254	0.203
24	0.414	0.276	0.207	0.165	0.433	0.289	0.217	0.173	0.458	0.304	0.229	0.183	0.485	0.326	0.245	0.196	0.530	0.353	0.265	0.212
25	0.431	0.287	0.216	0.172	0.451	0.301	0.226	0.180	0.477	0.317	0.238	0.191	0.505	0.340	0.255	0.204	0.552	0.368	0.276	0.221
26	0.448	0.299	0.224	0.179	0.469	0.313	0.235	0.188	0.496	0.330	0.248	0.198	0.525	0.354	0.265	0.212	0.575	0.383	0.287	0.230
27	0.465	0.310	0.233	0.186	0.487	0.325	0.244	0.195	0.515	0.343	0.258	0.206	0.546	0.367	0.275	0.220	0.597	0.398	0.298	0.239
28	0.483	0.322	0.241	0.193	0.505	0.337	0.253	0.202	0.534	0.355	0.267	0.214	0.566	0.381	0.286	0.228	0.619	0.412	0.309	0.247
29	0.500	0.333	0.250	0.200	0.523	0.349	0.262	0.209	0.553	0.368	0.277	0.221	0.586	0.394	0.296	0.236	0.641	0.427	0.320	0.256
30	0.517	0.345	0.259	0.207	0.541	0.361	0.271	0.217	0.572	0.381	0.286	0.229	0.606	0.408	0.306	0.245	0.663	0.442	0.331	0.265
31	0.534	0.356	0.267	0.214	0.559	0.373	0.280	0.224	0.591	0.393	0.296	0.237	0.626	0.422	0.316	0.253	0.685	0.457	0.342	0.274
32	0.552	0.368	0.276	0.221	0.577	0.385	0.289	0.231	0.610	0.406	0.305	0.244	0.647	0.435	0.326	0.261	0.707	0.471	0.354	0.283
33	0.569	0.379	0.284	0.228	0.595	0.397	0.298	0.238	0.629	0.419	0.315	0.252	0.667	0.449	0.337	0.269	0.729	0.486	0.365	0.292
34	0.586	0.391	0.293	0.234	0.613	0.409	0.307	0.245	0.649	0.431	0.324	0.259	0.687	0.462	0.347	0.277	0.751	0.501	0.376	0.301
35	0.603	0.402	0.302	0.241	0.631	0.421	0.316	0.253	0.668	0.444	0.334	0.267	0.707	0.476	0.357	0.286	0.773	0.515	0.387	0.309
36	0.621	0.414	0.310	0.248	0.649	0.433	0.325	0.260	0.687	0.457	0.343	0.275	0.727	0.490	0.367	0.294	0.795	0.530	0.398	0.318
37	0.638	0.425	0.319	0.255	0.667	0.445	0.334	0.267	0.706	0.469	0.353	0.282	0.748	0.503	0.377	0.302	0.813	0.545	0.409	0.327
38	0.655	0.437	0.328	0.262	0.685	0.457	0.343	0.274	0.725	0.482	0.362	0.290	0.768	0.517	0.388	0.310	0.840	0.560	0.420	0.336
39	0.672	0.448	0.336	0.269	0.703	0.469	0.352	0.281	0.744	0.495	0.372	0.298	0.788	0.530	0.398	0.318	0.862	0.574	0.431	0.345
40	0.690	0.460	0.345	0.276	0.721	0.481	0.361	0.289	0.763	0.507	0.382	0.305	0.808	0.544	0.408	0.326	0.884	0.589	0.442	0.354
41	0.707	0.471	0.353	0.283	0.740	0.493	0.370	0.296	0.782	0.520	0.391	0.313	0.828	0.558	0.418	0.335	0.906	0.604	0.453	0.362
42	0.724	0.483	0.362	0.290	0.758	0.505	0.379	0.303	0.801	0.533	0.401	0.320	0.849	0.571	0.428	0.343	0.928	0.619	0.464	0.371
43	0.741	0.494	0.371	0.297	0.776	0.517	0.388	0.310	0.820	0.546	0.410	0.328	0.868	0.585	0.439	0.351	0.950	0.633	0.475	0.380
44	0.759	0.506	0.379	0.303	0.794	0.529	0.397	0.318	0.839	0.558	0.420	0.336	0.889	0.598	0.449	0.359	0.972	0.648	0.486	0.389
45	0.776	0.517	0.388	0.310	0.812	0.541	0.406	0.325	0.858	0.571	0.429	0.343	0.909	0.612	0.459	0.367	0.994	0.663	0.497	0.398
46	0.793	0.529	0.397	0.317	0.830	0.553	0.415	0.332	0.877	0.584	0.439	0.351	0.930	0.626	0.469	0.375	1.017	0.677	0.508	0.407
47	0.810	0.540	0.405	0.324	0.848	0.565	0.424	0.339	0.897	0.596	0.448	0.359	0.950	0.639	0.479	0.383		0.692	0.519	0.415
48	0.828	0.552	0.414	0.331	0.866	0.577	0.433	0.346	0.916	0.609	0.458	0.366	0.970	0.653	0.490	0.392		0.707	0.530	0.424

*Modifications of these diameters may be required in order to suit various knurling conditions, such as materials and variations in practice.

Extracted from ASA B5.30-1953 with permission of publisher, American Society of Mechanical Engineers

Modernize Today for Profits Tomorrow

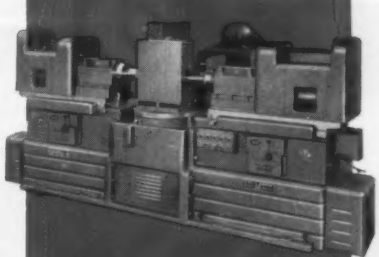
WITH FAST, VERSATILE PRECISION WAY MACHINES



EX-CELL-O TWO-WAY: Operates from a single push-button station. Handles large, heavy work. Fixture section can be designed to accommodate the way units from any angle.

Units may be re-arranged around fixture or new fixture sections designed for different operations.

EX-CELL-O ONE-WAY: A standard way unit combined with a fixture unit to suit the work. Large, heavy, and awkward parts, loaded in the fixture, remain stationary; the spindles advance to the work.



EX-CELL-O THREE-WAY: Standard way units are electrically interlocked to operate simultaneously, or in any sequence. Fast and efficient for machining parts from three directions and holding accurate locations.

EX-CELL-O FOUR-WAY: Controlled from a central push-button station. Particularly suitable for machining parts from four directions simultaneously, and performing progressive operations.

55-50

EX-CELL-O

WAY TYPE PRECISION BORING MACHINES ARE PROFIT INSURANCE

Way Machines perform such operations as precision boring, turning and facing. They consist of one or more standard way units combined with a fixture section. Each way unit has its own hydraulic system and controls to operate the spindle slide. Tooling and fixture are added to suit the individual operation. Get details from your Ex-Cell-O representative or write for Way Machine Catalog.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

XLO
EX-CELL-O for PRECISION

John C. Coonley, president of Hydraulic Press Mfg. Co.

JOHN C. COONLEY has been elected president and a member of the board of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. In assuming the presidency, Mr. Coonley fills a vacancy created last April.

DR. DAVID B. PARKINSON has been elected vice-president and general engineering manager of the Brush Electronics Co., Cleveland, Ohio. JOHN H. HARRIS has been elected vice-president and general works manager of the company. Doctor Parkinson joined the firm in 1948 and is responsible for all design and production engineering. Mr. Harris joined the company in 1944 and is responsible for direct manufacturing, production, control, maintenance and materials procurement.

A. C. ERHARDT, JR., has been appointed director of sales for the National Tool Co., Cleveland, Ohio. He succeeds JOSEPH B. CLOUGH, who is leaving the company to start his own concern, the Joseph B. Clough Co., Cleveland, Ohio, manufacturers' representatives. Mr. Erhardt joined National Tool Co. in 1933 and his first job was as a machinist.

DONALD M. PATTISON has been appointed director of marketing for the Motch & Merryweather Co., Cleveland, Ohio. Mr. Pattison was formerly with Warner & Swasey Co. for more than twenty-five years, most recently as vice-president of sales.

HOWARD C. GEBHART has been named chief engineer of the Rockwell Mfg. Co.'s Delta Power Tool Division plant at Bellefontaine, Ohio. He succeeds JOHN B. UNTERWEGER, who has been recently promoted to factory manager.

COLSON CORPORATION, Elyria, Ohio, has opened a new factory designed with removable walls on two sides. The plant is the first of six identical adjoining ones planned by the company.

WILLIAM R. ALEXANDER has been appointed director of engineering of the Steel Products Engineering Co., Springfield, Ohio. Formerly the assistant director, he replaces D. L. GETZ, who has resigned.

The new national headquarters for the PRESSED METAL INSTITUTE is at 3673 Lee Road, Cleveland, Ohio.

T. S. BONNEMA has been elected vice-president and general manager of Oster Mfg. Co., Cleveland, Ohio.

(Left) David B. Parkinson, vice-president and general engineering manager of Brush Electronics Co., and (right) John H. Harris, vice-president and general works manager

Raymond J. Wean, director of the Federal Machine & Welder Co.

RAYMOND J. WEAN has been elected a director of the Federal Machine & Welder Co., Warren, Ohio. The company manufactures Federal resistance welders and Warco presses.

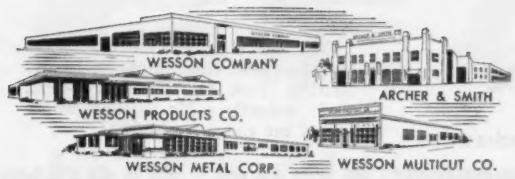
DOUGLAS B. FRASER has been named manager of the Cincinnati, Ohio, plant of Alco Products, Inc., Schenectady 5, N. Y.

Pennsylvania and Maryland

KENNAMETAL, INC., Latrobe, Pa., announces the following changes: W. D. TURNBULL, vice-president and general sales manager of the company, has retired from active management duties, but will continue with the firm in an advisory capacity; BENNETT BURGOON, JR., has been appointed sales manager; GILBERT A. BUNN, manager of the Detroit, Mich., division, has been placed on special management assignment at the firm's home office; and GEORGE DOLAN has been appointed manager of the newly formed Pacific Coast region. His headquarters are at 2600 Leonis Blvd., Los Angeles, Calif.

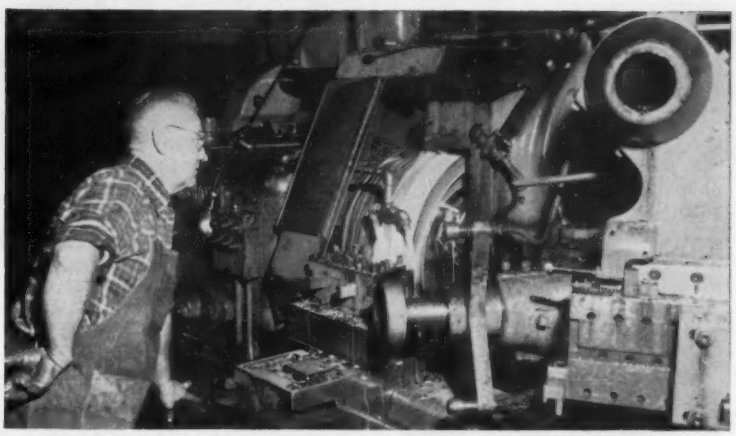
E. F. HOUGHTON & Co., Philadelphia, Pa., announces the following additions to its sales and service staff: C. GUY RIVERS has been appointed technical sales engineer in the Philadelphia area, southern New Jersey, and the State of Delaware; and EDWARD L. BABCOCK has been named hydraulic engineer in the Central New England area, which includes Worcester County in Hartford, Conn.

ROCKWELL MFG. CO., Pittsburgh, Pa., announces the following changes: H. E. RITTENHOUSE has been named chief engineer of the

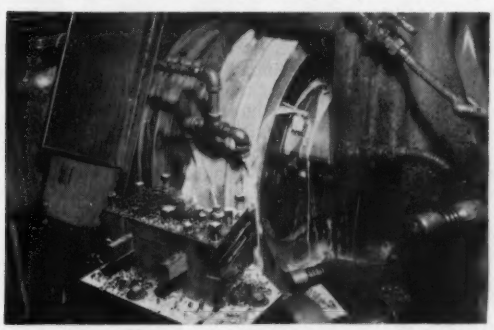


carbide NEWS

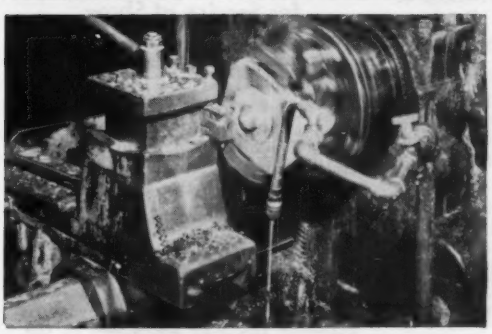
New Grade 26 Nearly Universal



Straddle facing the O. D. of a forged steel final drive gear on a 4F Gisholt Fastermatic lathe using Wessonmetal Grade 26. Tool life increased 40% over other carbides.



◀ *Closeup of straddle facing operation. Two solid carbide Grade 26 inserts are used. Job is being done at 260 sfm and 40 rpm. Feed varies from .017" to .020" with average depth of cut from 3/16" to ¼".*



◀ *Grade 26 produced a 30% increase in tool life on a severe interrupted cut on a tractor brake band anchor. Standard Wesson band-type Multicut is used on a Warner & Swasey turret lathe. Cutting speed ranges from 280 sfm down to zero. Feed is .027", depth of cut is ⅛".*

tools Wesson carbide Wessonmetal

Useable on 95% of steel cutting operations, it boosts tool life 40%

The nearest approach to a universal cutting grade available to the metalworking industry is a new carbide designated as "Grade 26" by Wesson Metal Corporation. Created primarily for all types of steel rough and semi-finish machining, it is also proving highly effective on some finishing operations.

Problems of carbide selection are greatly simplified by Wessonmetal Grade 26, since it cuts down the number of grades required for steel cutting operations by as many as four grades.

Optimum performance for Grade 26 extends over a range of 100 to about 400 sfm, covering 95% of steel machining operations encountered in industry today.

Much of Grade 26's record of outperforming all other steel cutting grades in 95% of all machining operations on which it has been applied is due to its superior edge cutting strength. Grade 26 was developed to have high red hardness and high thermal conductivity in order to function without any drop in performance at the elevated temperatures generated at high cutting speeds.

Improvement in tool life over all other grades has averaged about 40% on applications to date. Extensive tests have been conducted on a wide range of materials ranging from conventional steels to the high alloys used in high temperature applications.

Now in full production at Wesson Metal Corporation's new metals plants in Lexington, Ky., Grade 26 provides the answer to lower tool costs over a broad range of metal cutting operations.

For answers to your machining problems write:
WESSON COMPANY
DEPT. AD
1220 Woodward Heights Blvd.
Detroit 20, Michigan.

For more information on products advertised, use Inquiry Card, page 243

Pittsburgh Division, succeeding PAUL MANKIN, who has been promoted to general manager of that division; and ROBERT B. HUMPHREY has been named regional manager of the newly created east central region of the company's Delta Power Tool Division.

PHILADELPHIA GEAR WORKS, INC., Philadelphia, Pa., announces the opening of two new district sales offices. The Baltimore, Md., office which is under the direction of J. FRANK OTTINGER, is located at 1529 Pentridge Road; the Cleveland, Ohio, office which is under the direction of W. K. KOZEL, is located at 1900 Euclid Ave.

WILLIAM L. BATTEN has been made manager of the powder metallurgy department of Vanadium-Alloys Steel Co., Latrobe, Pa. He has been connected with the department as a sales and service engineer since its beginning in 1949.

RIVETT LATHE & GRINDER, INC., Boston, Mass., has announced the appointment of SCHROEDER BROTHERS, 3116 Penn Ave., Pittsburgh, Pa., as representative in the western Pennsylvania and West Virginia area.

WIEDEMANN MACHINE CO., Philadelphia, Pa., has appointed REES MACHINERY CO., INC., as their exclusive sales representative in western Pennsylvania, southeastern Ohio, and all of West Virginia.

WILLIAM A. MILLARD has been appointed sales manager of the Web Wire Division, New Brunswick, N. J., of the Carpenter Steel Co., Reading, Pa. He will maintain headquarters in the home office.

REM-CRU TITANIUM, INC., Midland, Pa., has purchased five buildings and ten acres of land in Midland which will allow for future expansion.

A. A. MARQUER, JR., has been appointed supervisor of employment for the Crucible Steel Company of America, Pittsburgh, Pa.

KAISER ALUMINUM & CHEMICAL CORPORATION, Oakland, Calif., has purchased from the General Services Administration the aluminum extrusion plant at Halethorpe, Md., which has been operating since 1951 under the terms of a lease with the agency.

* * *

On January 25, 1955 one of this nation's latest jet fighters climbed to 10,000 feet, from a standing ground start, in eighty-three seconds. Since then, an unofficial climb record has been established, the plane climbing to 10,000 feet from a standing ground start in fifty-six seconds.

Obituaries

Hardage L. Andrews

Hardage L. Andrews, president of Jones & Lamson Machine Co., Springfield, Vt., died recently at the age of sixty-five years. Mr. Andrews was associated with General Electric Co. after his graduation from the University of Missouri. He was given increasing responsibility throughout his association with the company. In 1950, he was elected an executive vice-president of General Electric and remained in that capacity until his retirement in the fall of 1951. He was appointed president of Jones & Lamson Machine Co. in 1953.

Hardage L. Andrews

ROBERT G. EMRICK, president of the Ettco Tool Co., Inc., Brooklyn, N. Y., died suddenly on August 5 at his home in Manhasset, N. Y., at the age of thirty-nine years. Mr. Emrick had been associated with the company throughout his entire business career and had been elected president in March of this year.

BEN L. COOK, district manager of the Pittsburgh, Pa., office of the Timken Roller Bearing Co., Canton, Ohio, died on September 6 at the age of forty-seven years. Mr. Cook joined the company in 1930. He was named district manager in 1944.

E. VON HAMBACH, research and development engineer of the Carpenter Steel Co., Reading, Pa., died on August 11 at the age of sixty-two years. He was a nationally known pioneer in the development and fabrication of stainless steels and enjoyed the title of "Mr. Stainless."

DOUGLAS G. HAWKSWORTH, vice-president and chief engineer of the Gairing Tool Co., Detroit, Mich., died recently. Mr. Hawksworth joined the company in 1927.

Coming Events

OCTOBER 17-21—National Metal Exposition and Congress sponsored by the AMERICAN SOCIETY FOR METALS at the Convention Halls, Philadelphia, Pa. Further information from American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

OCTOBER 23-26 — Semi-annual meeting, AMERICAN GEAR MANUFACTURERS ASSOCIATION at the Edgewater Beach Hotel, Chicago, Ill.

OCTOBER 27-28—ELEVENTH ANNUAL NATIONAL CONFERENCE ON INDUSTRIAL HYDRAULICS to be held at the La Salle Hotel, Chicago, Ill. For further information, write to the Illinois Institute of Technology, 35 W. 33rd St., Chicago 16, Ill.

NOVEMBER 9-12—Annual meeting, NATIONAL SOCIETY OF ALUMINUM DISTRIBUTORS at the Arizona Biltmore Hotel, Phoenix, Ariz.

NOVEMBER 14-18—Chicago Exposition of Power and Mechanical Engineering, under the auspices of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS, in conjunction with their Seventy-fifth Anniversary Meeting, to be held in the Chicago Coliseum, Chicago, Ill. Further information can be obtained from the International Exposition Co., 480 Lexington Ave., New York 17, N. Y.

* * *

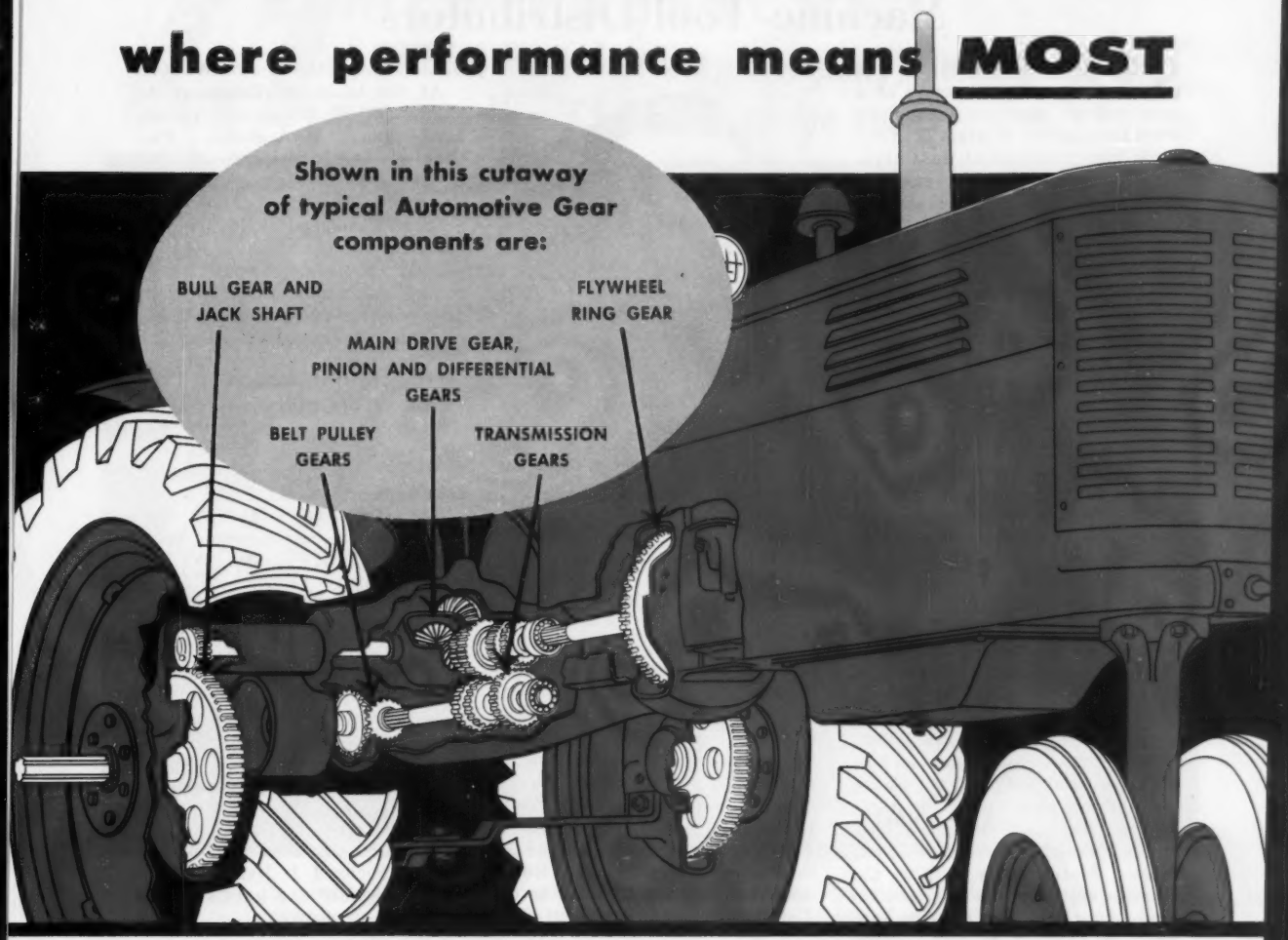
Oil Companies Commended for Service at Show

Four oil companies—F. E. Anderson Oil Co., E. F. Houghton & Co., Socony Mobil Oil Co., Inc., and Sun Oil Co.—were commended by Tell Berna, general manager of the National Machine Tool Builders' Association, for their outstanding service to exhibitors at the Machine Tool Show.

"These companies," said Mr. Berna, "were invited by the Association to render a lubrication and coolant service to machine tool builders exhibiting in the Show. They were assigned space as exhibitors in the Ampitheatre so that they would be instantly available for such service. Their engineers remained after the Show ended to assist in the equally big job of applying such other petroleum products as rust preventatives to protect the machines during the return trip to the manufacturers' plants or the plants of customers."

GEARS

where performance means MOST


Shown in this cutaway of typical Automotive Gear components are:
BULL GEAR AND JACK SHAFT
FLYWHEEL RING GEAR
MAIN DRIVE GEAR, PINION AND DIFFERENTIAL GEARS
BELT PULLEY GEARS
TRANSMISSION GEARS

When gears are used to transmit power there's no standard of comparison equal to on-the-job-performance. This is particularly true of farm machinery, where the dependability of gears is essential in maintaining the planting, cultivating and harvesting schedules.

Automotive Gears are used in a wide variety of the best-known, best-made farm machines. Their record is worth your inspection—no matter what your gear problem may be. This is particularly true if you are considering a source with the experience, the engineering service, and the facilities to serve as your "gear department." Just write or phone.

DOUBLE DIAMOND TRADE MARK GEARS

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

Automotive Gear Works, inc.

ESTABLISHED IN 1914 — RICHMOND, INDIANA

Thirty-First Annual Meeting of the Machine Tool Distributors

SPECTACULAR advances in tool design and the start of a new era in machine technology were forecast by William C. Newberg, vice-president of the Chrysler Corporation and president of its Dodge Division, in his talk at a luncheon meeting of the American Machine Tool Distributors' Association, September 5. All sessions of the thirty-first annual meeting of the Association took place at the Sheraton-Blackstone Hotel, Chicago, Ill.

Mr. Newberg predicted startling changes in machine tool design and use within the next ten years which may make present production methods obsolete. He also lauded designers and toolmakers for the tremendous advances they have made in metal-cutting machines in the past thirty years.

Liberalized federal tax write-offs on equipment to help industry keep pace with rapid improvement in machine tool design was called for by Mr. Newberg. He declared that industrial tools "no longer wear out," but are replaced by new equipment doing more work faster.

More than 600 machine tool distributors and builders, attending the luncheon as guests of the Association, also heard General Williston B. Palmer, Vice-Chief of Staff, United States Army, outline the Army's stand-by machine tool reserve program. The General said that, in addition to this reserve program, the Army recognizes the need for the "latest and best tools." In the event of mobilization, according to General Palmer, it is planned to place orders in systematic fashion, "so that we can start using the new tools for high-speed production with less manpower around the end of the first year of war."

At the regular business session, earlier in the day, Milburn A. Hollengreen, president of the National Machine Tool Builders' Association, told the distributors that companies relying on machine tools must reduce their costs because of increases in both wages and the price of materials. He said, "In order to protect their profit picture, machine tool using companies must reduce their costs. The obvious way to do it is to throw out the old high-cost machines and put in new ones that will turn out more work per man-hour. . . . The question now is not whether or not a company can afford to buy new machine tools—the question is how long can a company afford to keep on operating the old high-cost machines which it now has in its plants." Tell Berna, general manager of the National Machine Tool Builders' Association, also spoke to the distributors on the pertinent question of "After the Show—What?"

Henry R. Hanson, newly elected president of the American Machine Tool Distributors' Association

At the luncheon, Raymond A. Vidinghoff of Machinery Associates, Inc., Wynnewood, Pa., the retiring president of the A. M. T. D. A., commented that America's "continued world leadership will depend on future contributions of the machine tool industry." He said, "With a rapidly expanding economy resulting from a population with an insatiable appetite for the better things of life—a constant demand from the military to provide the capacity to produce those weapons of war so vital to maintaining peace—we are forever prodded with a two-pronged fork to keep abreast of requirements."

The following officers were elected for the coming year: President, Henry R. Hanson, William K. Stamets Co., Cleveland, Ohio; first vice-president, Joseph F. Owens, Jr., J. F. Owens Machinery Co., Syracuse, N. Y.; second vice-president, Frank H. Habicht, Marshall & Huschart Machinery Co., Chicago, Ill.; and secretary-treasurer, J. O. Ellison, Harron, Rickard & McCone Co. of Northern California, San Francisco, Calif.

Lieutenant Governor John William Chapman of Illinois, and Mayor Richard J. Daley of Chicago welcomed the guests to the luncheon.

Attendance at Machine Tool Show Sets New Record

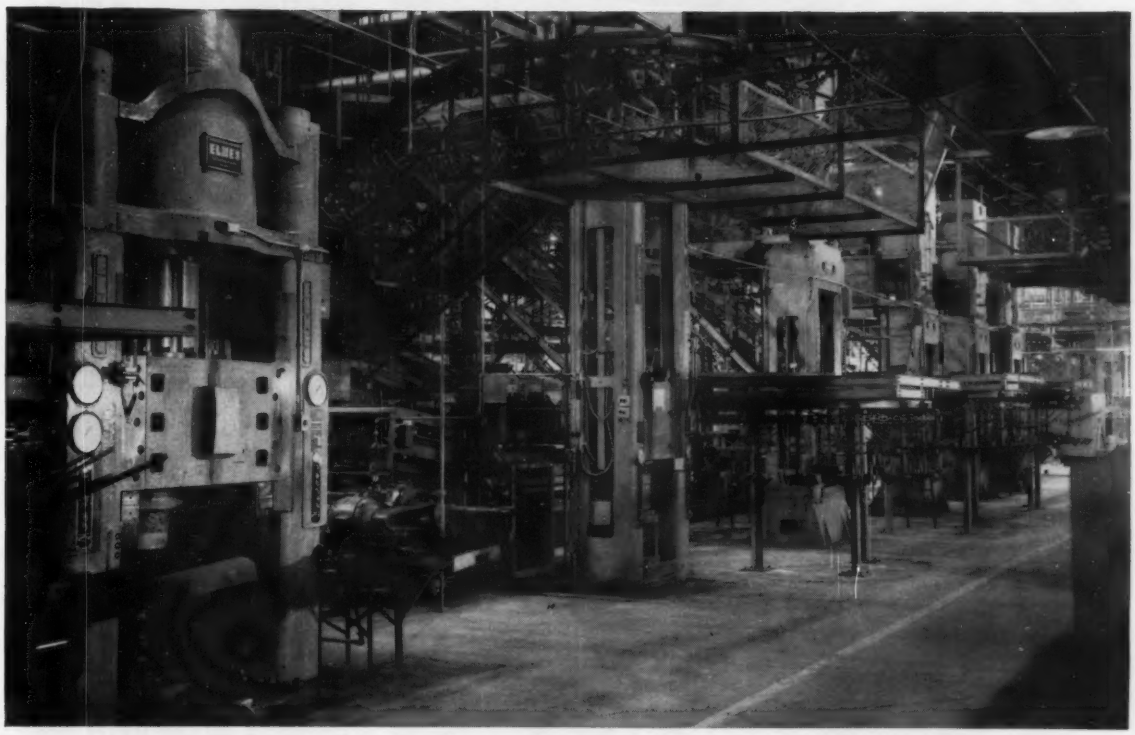
Total registration at the 1955 Machine Tool Show far exceeded all expectations. The final day's registration was 2500, bringing the total to a record-breaking 102,631. Since most visitors to the Show came on two or three successive days, the over-all attendance was actually something over 300,000 and established a new all-time high for such exhibitions. Visitors were chiefly production executives and engineers concerned with manufacturing problems from the standpoint of costs. There were 917 machine tools displayed with a value in excess of $20,000,000. It is estimated that it will require almost a month to prepare the machines for shipment.

A.S.M.E. Motion Picture on Mechanical Engineering

"To Enrich Mankind" is a twenty-five minute sound-color movie dramatizing the mechanical engineering profession. Produced for the American Society of Mechanical Engineers as part of its Diamond Jubilee, the film acquaints the layman with the significance the profession has to the national economy. The theme is a dialogue between a come-to-life statue of the Greek mathematician and engineer Archimedes and a workman in a museum. The 16-millimeter film is available for free loan to schools, service organizations, and television stations from the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

27 ELMES PRESSES . . .

at RHEEM Manufacturing Company, Burlington, N.J. mass-produce 75 mm. cartridge cases



To meet exacting requirements for the deep drawing and forming of 75 mm. cartridge cases, the Rheem Manufacturing Company selected ELMES® Hydraulic Presses. Three similar production lines, consisting of nine Elmes Presses each, were installed. Partial view of one of these Elmes Hydraulic Press cartridge case production lines is shown. Each production line's sequence of operation is as listed below.

OPERATION	PRESS USED	OPERATION	PRESS USED
Precup	200 ton	Prehead	1500 ton
Cup	200 ton	4th Draw	60 ton
1st Draw	150 ton	Head	2500 ton
2nd Draw	125 ton	Taper	75 ton
3rd Draw	75 ton		

Each of the Elmes Presses is equipped with full electrical pushbutton controls. On the draw presses, operating speeds are as high as 2200 ipm on advance and return, with pressing speeds as high as 780 ipm. Strokes vary from 30″ to 84″. This important installation is additional evidence of the high regard the metalworking industry holds for Elmes Press performance. Let Elmes assist *you* in selection of the *right* press for your production. Recommendations and cost estimates are yours for the asking.

ELMES

AMERICAN STEEL FOUNDRIES • ELMES ENGINEERING DIVISION
1162 Tennessee Avenue . . . Cincinnati 29, Ohio

HYDRAULIC PRESSES & EQUIPMENT

METAL-WORKING PRESSES • PLASTICS MOLDING PRESSES • PUMPS • ACCUMULATORS

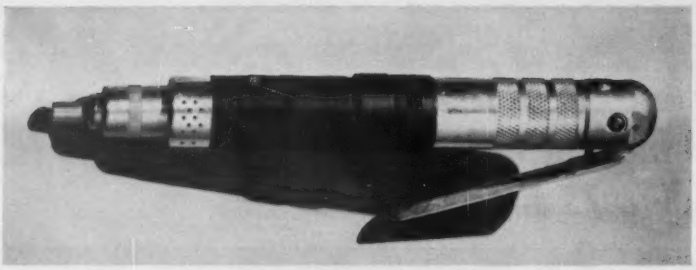


Fig. 1. Torque-controlled portable screwdriver brought out by the Chicago Pneumatic Tool Co.

Torque-Controlled Portable Power Screwdrivers and Nutrunners Equipped with Magnetic Clutch

A series of torque-controlled, portable power screwdrivers and nutrunners for high-production applications has been developed by the Chicago Pneumatic Tool Co., New York, N. Y. This series of tools, one of which is shown in Fig. 1, is called the "Magnamatic." Tools in this series feature a new type of magnetic "one-shot" clutch which gives precise control of the torque employed to tighten nuts, screws, and other threaded fasteners. Reduction of work spoilage, higher production rates, and reduced clutch maintenance costs are advantages claimed for the screwdriver. A new type of acoustic baffle is said to lower operating noise. Thirteen models, including both reversible and non-reversible types, handle screw sizes from No. 4 up to 3/8 inch.

The design and operation of the "Magnamatic" screwdriver are shown by four views in Fig. 2. With no axial pressure on the spindle, spring *J*, view W, holds latch-pin *D* forward. This pin, in turn, holds positive clutch pin *B* forward and disengaged from the positive clutch jaw *C*. Magnet *M* holds armature plate *L*, keeping the torque clutch lower jaw *K* engaged with the torque clutch upper jaw *N*. In this position all parts rotate except the hexagonal drive spindle *A* and pin *B*. The spindle is, therefore, "dead."

With the tool on the work and axial pressure applied, as shown in view X, the hexagonal drive spindle *A* is forced rearward, engaging pin *B* with jaw *C*. Drive shank *A* is thus rotated, driving the screw home. Moving rearward, clutch pin *B* pushes latch-pin *D* to the rear, compressing spring *J*. Latch sleeve *F* is prevented from moving rearward by lock-pin *G* and spring *E* is, therefore, compressed.

At the desired torque, lower jaw *K* (view Y) cams out of engagement with upper jaw *N*, against the pull of magnet *M*. When the distance between the armature plate *L* and the magnet reaches about 0.015 inch, the magnet pull is overcome and the camming action throws jaw *K* further forward. When jaw *K* moves forward, its inside taper permits lock-pin *G* to be moved outward through the action of tapered sleeve *F*, which is pushed rearward by spring *E*. Pin *G* wedges on the taper of jaw *K*, preventing it from engaging jaw *N*. Thus, the jaws disengage instantly at the desired torque and are positively locked out of engagement, preventing further torque build-up no matter how long the tool is held on the work.

With the tool removed from the work, spring *J* (view Z) pushes pin *D* forward, thus disengaging pin *B* from jaw *C*. Latch sleeve *F* also moves forward. The taper on the sleeve allows lock-pin *G* to be pushed in toward the axis by the taper on lower jaw *K*. The lower jaw moves rearward until armature plate *L* contacts magnet *M*. The torque clutch is engaged by the magnet until the next screw is driven to the proper torque. All parts are now in the position shown at W, and the tool is ready to drive the next screw.

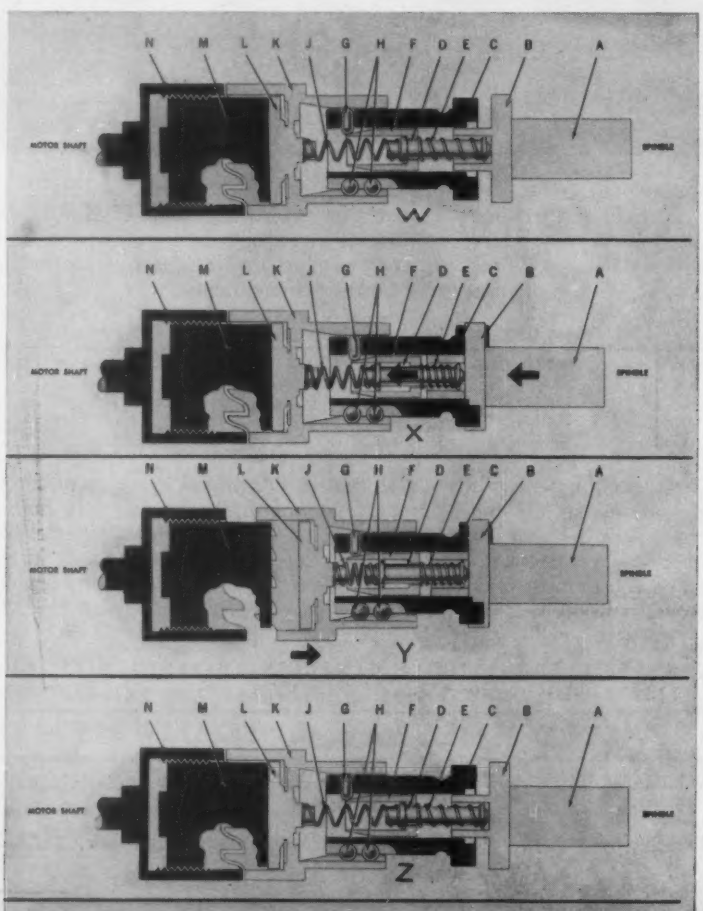
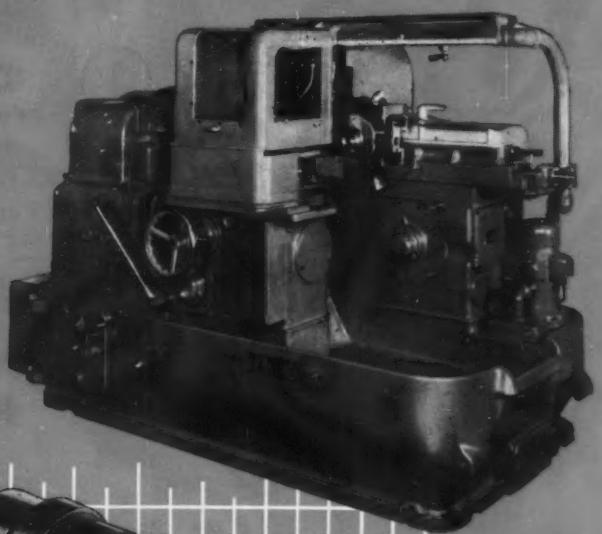


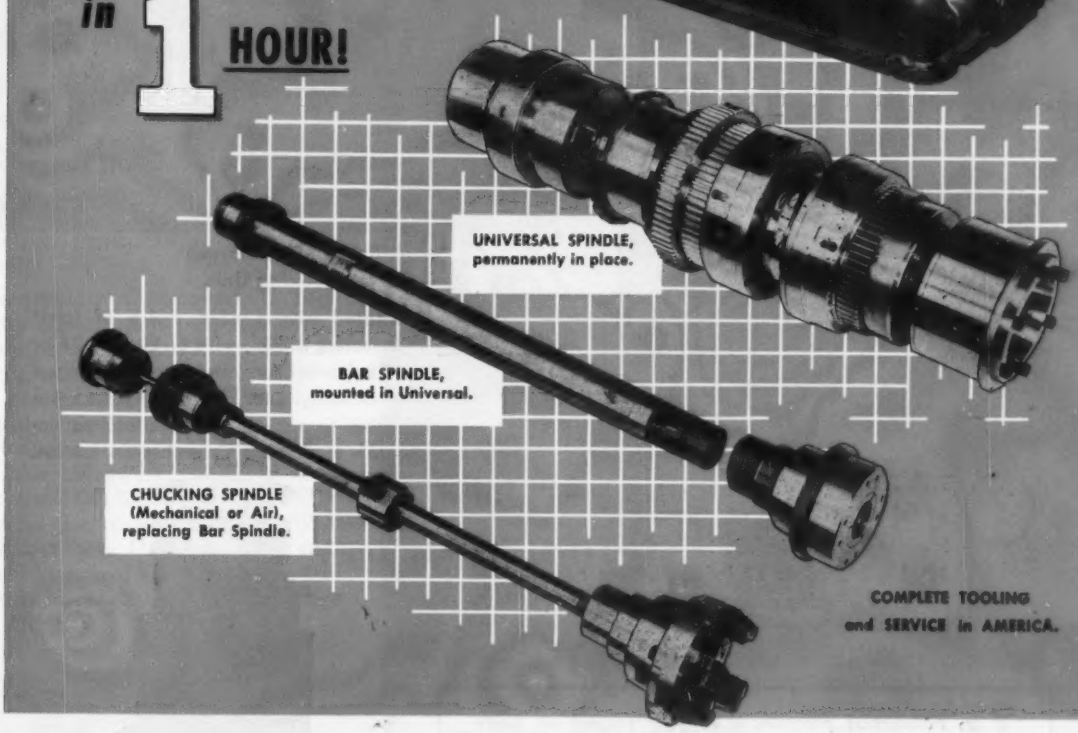
Fig. 2. Views illustrating operation of torque-controlled screwdriver shown in Fig. 1.

TAREX AUTOMATICS

. . . here's JUST ONE of the salient features of this machine which is made with SWISS PRECISION throughout:

The ability to change from BAR work to a CHUCKING machine in 1 HOUR!




UNIVERSAL SPINDLE, permanently in place.
BAR SPINDLE, mounted in Universal.
CHUCKING SPINDLE (Mechanical or Air), replacing Bar Spindle.

COMPLETE TOOLING and SERVICE in AMERICA.

RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

Swanson

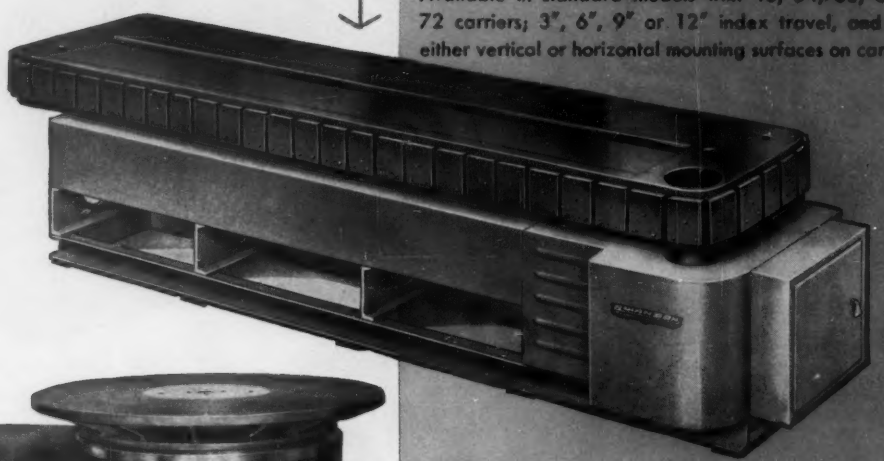
NOW OFFERS 3—

standard, basic machine chassis for automation . . . to cut costs and shorten completion time for special purpose machines.

1

THE AUTO-TRAN
Transfer Type Indexing Unit.

Available in standard models with 48, 54, 60, 66 or 72 carriers; 3", 6", 9" or 12" index travel, and with either vertical or horizontal mounting surfaces on carriers.



2

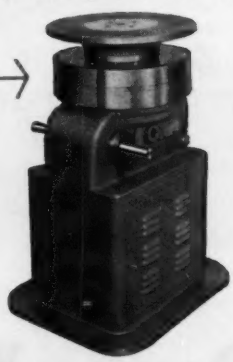
THE SERIES H (large)
Turret Indexing Unit.

Offered with a wide choice of turret diameters to 72"; with 8, 12, 16, 24 or 32 index positions, and a complete range of indexing rates and dwell times. Exclusive Swanson turret lock assures accurate positioning at each work station.

3

THE SERIES B-C (medium)
Turret Indexing Unit.

Standard models include turret diameters to 40"; 6, 8, 12, 16, 18, 24 or 32 index positions and a complete range of indexing rates and dwell times. Also features the exclusive Swanson turret lock.



If an automation program is in your present or future plans, write, wire or phone for full details on these units and other standard Swanson components and accessories.

Quality SWANSON TOOL & MACHINE PRODUCTS INC., ERIE PA. *Since 1919*

ENGINEERS and BUILDERS of AUTOMATIC and SPECIAL PURPOSE MACHINES

For more information on products advertised, use Inquiry Card, page 243

7 benefits received by switch to STANOSTAMP *Compound C*

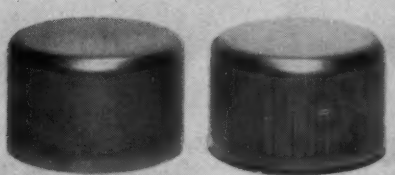
Jagemann Stamping Company, Manitowoc, Wisconsin, benefited seven ways by switching to STANOSTAMP Compound C. Finished ferrules drawn from 19 gauge cold roll steel were being badly scored. At the same time dies were being scratched and excessive heat experienced in the press. Standard Oil lubrication specialist R. E. O'Brien suggested STANOSTAMP. The result:

1. Production increased 20%
2. Die maintenance reduced 30%
3. Spoilage reduced
4. Finish improved
5. Galling minimized
6. Cooler machine operation
7. Washability improved

The results add up to this: There is a combination in the field of industrial lubrication that is hard to beat. It is (1) Standard Oil lubrication specialists capable of giving technical help and (2) Top quality products *that deliver results.*

STANOSTAMP Compound C is a water emulsifiable paste for heavy drawing operations. It contains an inert, non-abrasive mineral filler for protection of dies and work, is readily cleaned from work in conventional washing equipment. In the Midwest, your nearby Standard Oil lubrication specialist will be glad to tell you more about STANOSTAMP. Call him. Or contact: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Father and son inspect ferrules. William P. Jagemann (left), President, and son William T. Jagemann note improved finish on work produced using STANOSTAMP.



Air hose ferrules. One at right produced before switch to STANOSTAMP, one at left produced after conversion to this forming compound. Scoring of dies as well as work occurred before switch.

STANDARD OIL COMPANY
(Indiana)

STANDARD

B7 NEW BOND TYPE

★ **LONGER WHEEL LIFE**

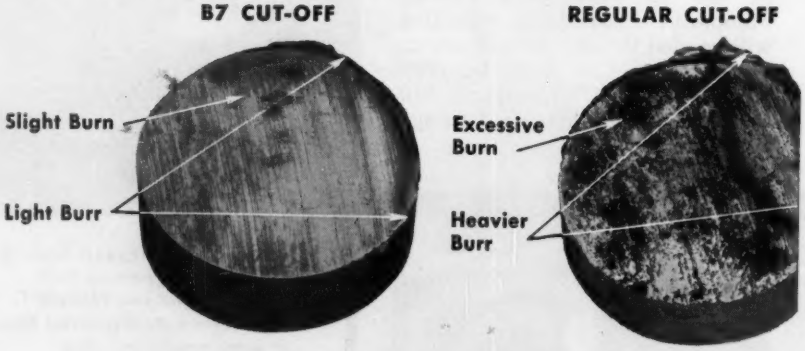
with equal quality of finish

B7 BOND WHEEL

After same number of cuts, B7 outlasts Wheels "A" and "B" by 10-25%.

★ **BETTER QUALITY OF FINISH**

with equal wheel life

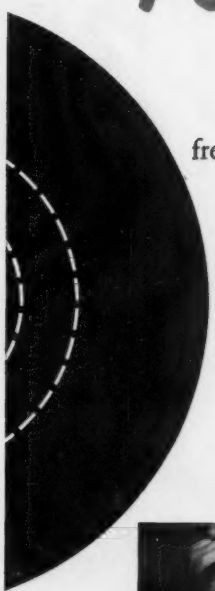


COLD ROLLED BAR STOCK, 1⅛" DIAMETER

...continually puts more SENSE in your abrasive DOLLAR

SETS NEW STANDARDS OF PERFORMANCE

FOR ABRASIVE CUT-OFF



WHAT ARE YOU LOOKING FOR in your cutting-off operations... freedom from burn and burr?... close tolerance accuracy?... high production?

Here's a revolutionary new bond type—B7—which is the finest combination yet developed to give you maximum work finish, maximum cut-off speed, and maximum wheel life.

Thousands of these new wheels have been job-proven on work just like yours. The B7 Bond Cut-Off Wheel is *another* CARBORUNDUM development. It's a wheel you'll use with profit!

PLUS NEW FEATURES

NEW distinctive wheel marking —for instant recognition

NEW simplified gradings —R, T, V grades only

NEW rough sides are standard— no need to specify RS on order

TRY ONE YOURSELF!

A simple demonstration in your shop, on any material you're cutting, will convince you that B7 Bond Resinoid Cut-Off Wheels will outperform any other wheels you can use. Call your Carborundum Distributor or salesman to arrange a time most convenient to you. He's listed in the yellow pages of your phone book under "Abrasives" or "Grinding Wheels."

CARBORUNDUM

REGISTERED TRADE MARK

REVOLUTIONARY **NEW**

CLEVELANDS

. . . obsolete all other single spindle automatics of comparable capacities!

NO turret feed cams!

NO spindle change gears!

Presenting the new 1 3/8" and 1 5/8" Model AB

CLEVELAND DIALMATICS

WITH ELECTRONIC TURRET TOOL FEED DRIVE
AND ELECTRONIC INFINITELY VARIABLE SPINDLE SPEED DRIVE

Write for New 1 3/8"/1 5/8" Model AB Bulletin

Spindle speeds and turret tool feeds are . . .

COMPLETELY DIAL CONTROLLED

CONTROL PANEL DIALS enable you to *pre-select* highly accurate and infinitely variable forward and reverse *spindle speeds* and forward and return *tool feeds* for each of five turret positions. Each tool is completely and individually controlled throughout the cycle. Each control is not bound to any preceding or succeeding control in any way. There are no turret feed cams—no change gears. You simply *set* the dials to obtain the *optimum* feed and spindle speed for maximum productivity of each working tool!

Again, as for 64 years, Cleveland sets the pace in single spindle bar automatic design!

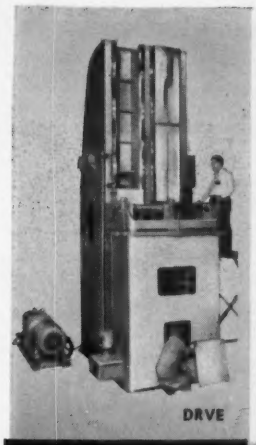
Many revolutionary features—each speeding set-up time, increasing productivity, lowering costs—are incorporated into these outstanding new Clevelands. Write direct today, or call in the Cleveland sales engineer in your area for full details.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4936 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

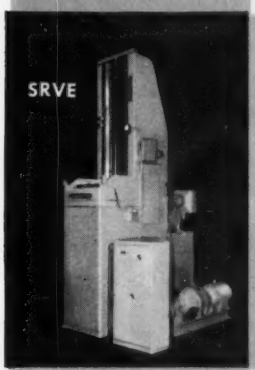
Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

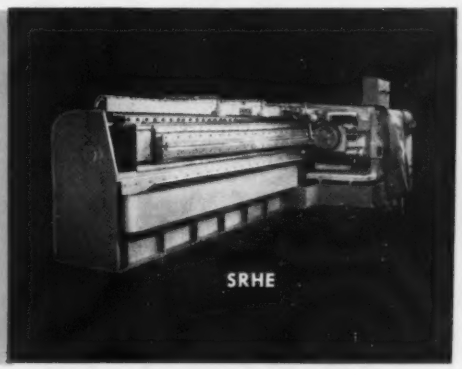


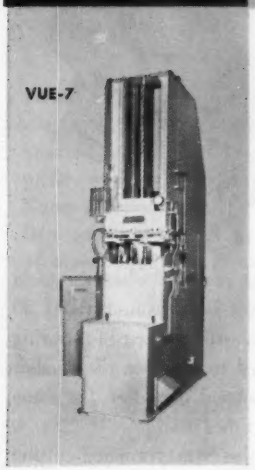
what BROACHING NEWS created the *greatest interest* in Chicago, at the MACHINE TOOL SHOW

. . . if you were there, you know

it was the 5 electro-motive drive LAPOINTE BROACHING MACHINES!







The 3 vertical machines and the 2 horizontal machines developed by LAPOINTE with electro-motive drive embody the world's greatest advances in the history of broaching. These machines, in fact, can represent *the most productive floor space in your plant!*

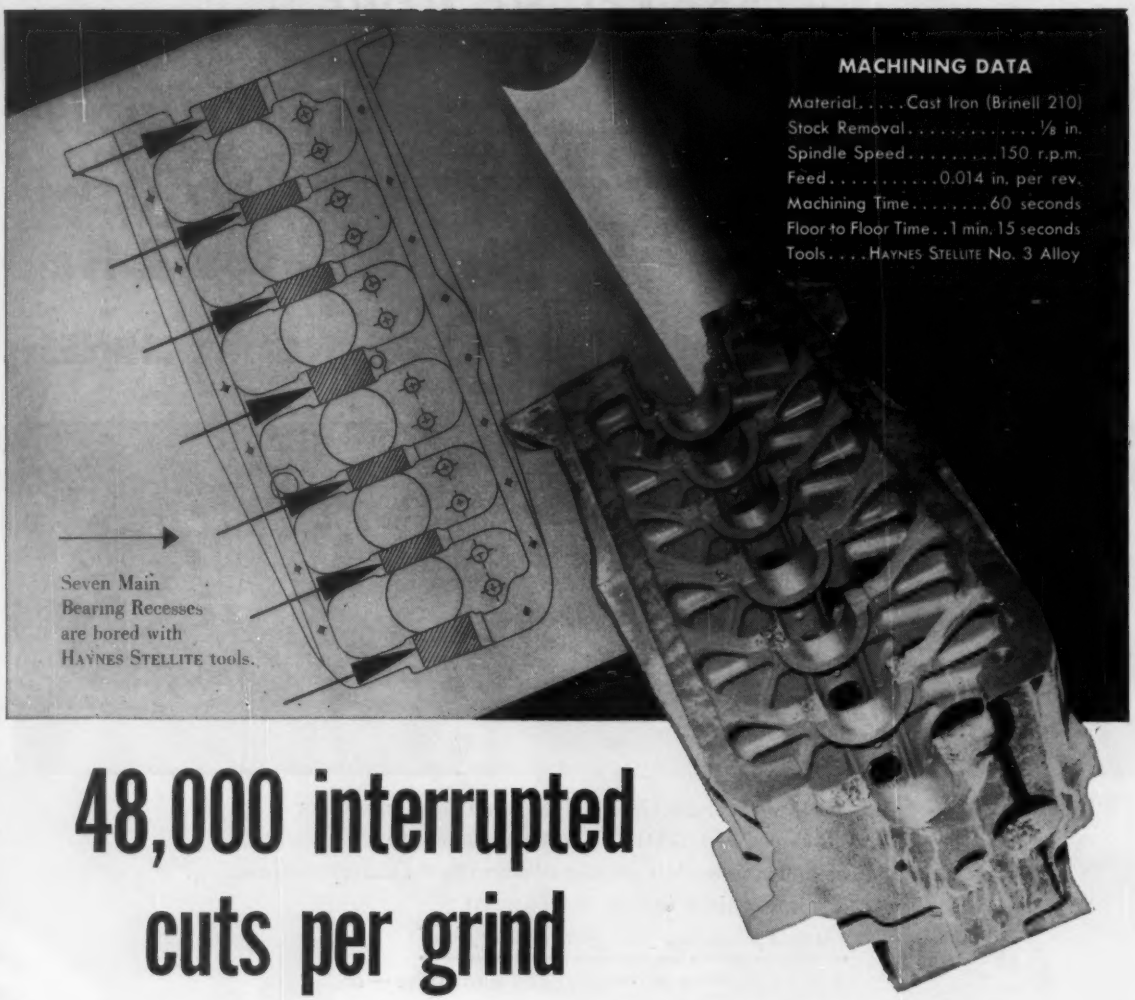
Just why is everyone — especially automotive — turning to the *electro-motive drive* for broaching?

1. **Amazing increases in production**
   Broaching speeds up to 300 feet-per-minute (and more) have scrapped all previous concepts of production output!
2. **Elimination of chatter**
   Smooth, powerful drive through a mechanical bull gear rack eliminates all chatter and substantially improves quality of work.
3. **Permits carbide tooling**
   The high speeds and smooth operation make carbide tooling completely practical.
4. **Prolonged tool life**
   Increases of 400% to 500% in tool life, between grinds, reduce downtime and show real dollar savings in tools.

Send for descriptive literature on all 5 LAPOINTE ELECTRO-MOTIVE DRIVE Broaching Machines.

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES


MACHINING DATA
Material. . . . .Cast Iron (Brinell 210)
Stock Removal. . . . . 1/8 in.
Spindle Speed. . . . . .150 r.p.m.
Feed. . . . . .0.014 in. per rev.
Machining Time. . . . . .60 seconds
Floor to Floor Time. . 1 min. 15 seconds
Tools. . . . HAYNES STELLITE No. 3 Alloy
Seven Main Bearing Recesses are bored with HAYNES STELLITE tools.

48,000 interrupted cuts per grind

HAYNES STELLITE tools machine the main bearing recesses in 320 cast iron engine blocks between grinds. Each of 14 tools used in the set-up makes 150 interrupted cuts in each block . . . a total of 48,000 interrupted cuts per grind. The tools remain in operation for a full eight-hour shift, without chipping or spalling. Other tools tested on this job chipped under the constant hammering of the intermittent cuts, and had to be replaced in less than an hour.

Standard tool bits ⅜ in. square and 2 in. long, made of HAYNES STELLITE alloy No. 3, are used for this operation. Only 0.015 in. of metal has to be removed when the tools are sharpened, and the tools can be reground about 30 times. Then, when they are too short to be used for boring the main bearings, they are used to machine the smaller cam bearing recesses. In this second operation the same tools can be reground about 50 times more!

There are four grades of HAYNES STELLITE metal-cutting tools varying in hardness, compressive strength, and impact resistance. For a complete description of properties, sizes, and recommended operating data, write for the free booklet, "HAYNES STELLITE Metal-Cutting Tools."

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

UCC

General Offices and Works, Kokomo, Indiana

Sales Offices

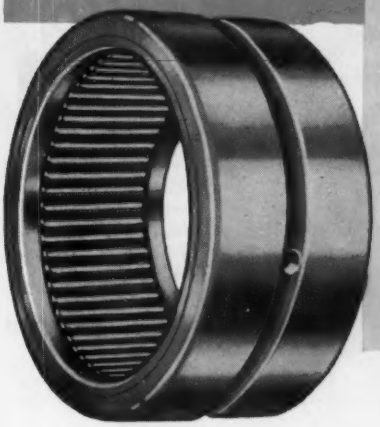
Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation

ORANGE ROLLER BUSHINGS

"carry heavy radial loads, with long life and low maintenance cost"

report KANE & ROACH, Inc., Syracuse, N. Y.



K & R No. OHLS 10 Stand Cold Roll Forming Machine shown below is used for cold roll forming of various shapes. An extremely accurate, rugged machine, it features outboard housings which are adjustable laterally of the base, to accommodate narrower but heavier materials when needed. The roll stands are also adjustable longitudinally of the base which permits the most efficient spacing of rolls for various shapes. Vertical adjustment of both the upper and lower roll shafts allows "downhill" feed.

Twenty Orange Roller Bushings are installed in the outboard roll shafts because of high radial capacity and freedom from trouble. Kane & Roach, Inc., have used Orange Roller Bearings in many of their machines since 1940.

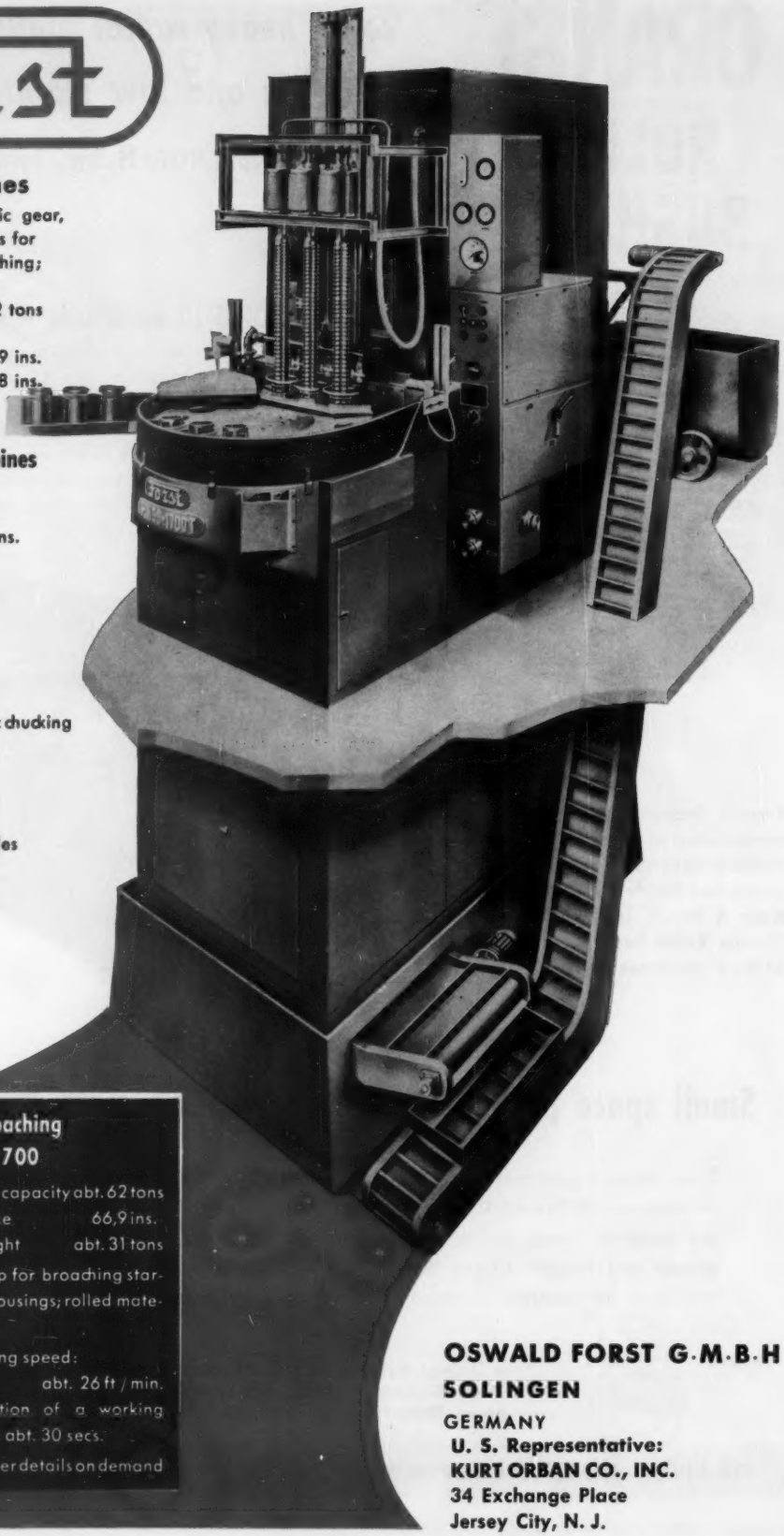
Small space permits compact designing, with high load capacity

There are very good reasons for the outstanding performance of Orange Roller Bushings. They are made of finest bearing steel—hardened, ground and finished to the highest precision standards for durable, friction-free operation. Exacting control of roller uniformity by electronic gauging, permits closer internal running clearances, minimizing possibility of misaligned rollers. Wherever a needle bearing is indicated, install Orange Roller Bushings for maximum protection.

• Orange Roller Bushings are available in stock sizes from ½" to 8" shaft diameters. Stocks and engineering service in all industrial areas. Write for latest catalog.

ORANGE ROLLER BEARING CO., INC., 552 Main Street, Orange, N. J.

Forst



Broaching Machines

with low pressure, hydraulic gear, horizontal and vertical types for internal and surface broaching; pulling capacity:
up to abt. 62 tons
Maximum stroke:
vertical types = 79 ins.
horizontal types = 138 ins.

Broach Sharpening Machines

for circular shaped and slab broaches.
Max. length of tools 31,5 ins. and 59 ins.

Broaches

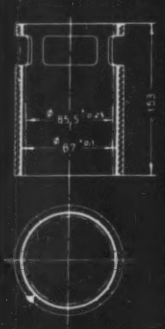
Fixtures

for mechanical and hydraulic chucking

Gages

for checking broached profiles

Vertical Internal Broaching Machine RSI - 56/1700



Max. capacity abt. 62 tons
Stroke 66,9 ins.
Weight abt. 31 tons
set up for broaching starter housings; rolled material
Cutting speed:
abt. 26 ft / min.
Duration of a working cycle abt. 30 secs.
Further details on demand

OSWALD FORST G·M·B·H
SOLINGEN
GERMANY
U. S. Representative:
KURT ORBAN CO., INC.
34 Exchange Place
Jersey City, N. J.

For more information on products advertised, use Inquiry Card, page 243

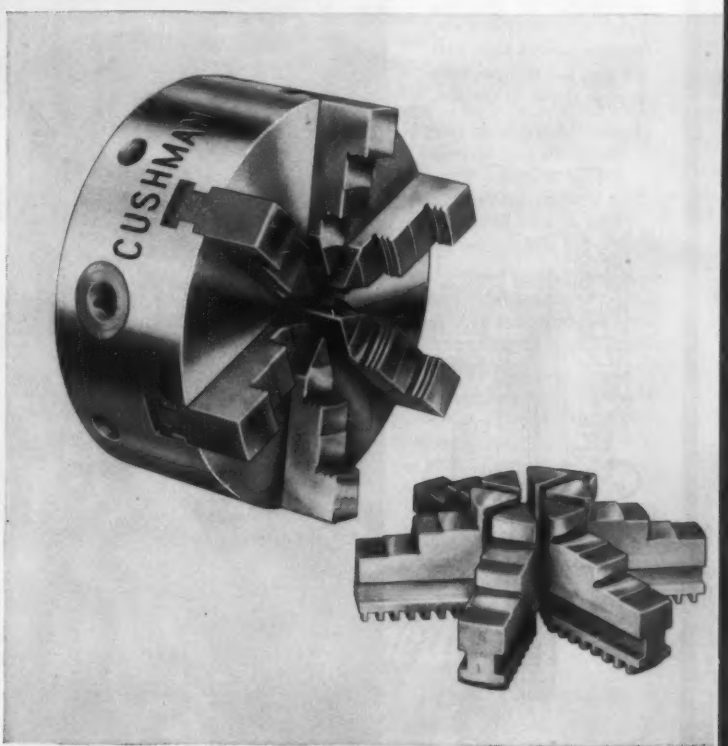
CUSHMAN chucks give Chuck-ability

CHUCK-ABILITY: The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . .through design and selection of the right work-holding devices.

. . . the *New* Accra-Set* Chucks

- Ideal for precision bar work.
- Quick, simple, minute adjustment.
- Repeats within .0005" or better T.I.R.
- Because of extreme accuracy and jaw capacity, one Accra-Set* Chuck can replace even the most accurate collet chuck and its range of collets.

* Patent applied for.



Available with 3 or 6 jaws in 6", 7½" and 9" sizes. Adapter plates required for mounting.

THE CUSHMAN CHUCK COMPANY
Hartford 2, Connecticut
a world standard for precision

CUSHMAN CHUCKS . . . a Product of American Quality, Labor and Materials.

CUSHMAN CHUCKMAN CHUCKS Exclusively SINCE 1902

SEE YOUR INDUSTRIAL DISTRIBUTOR

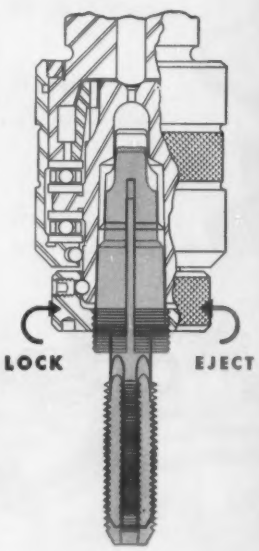
manufacturers of:

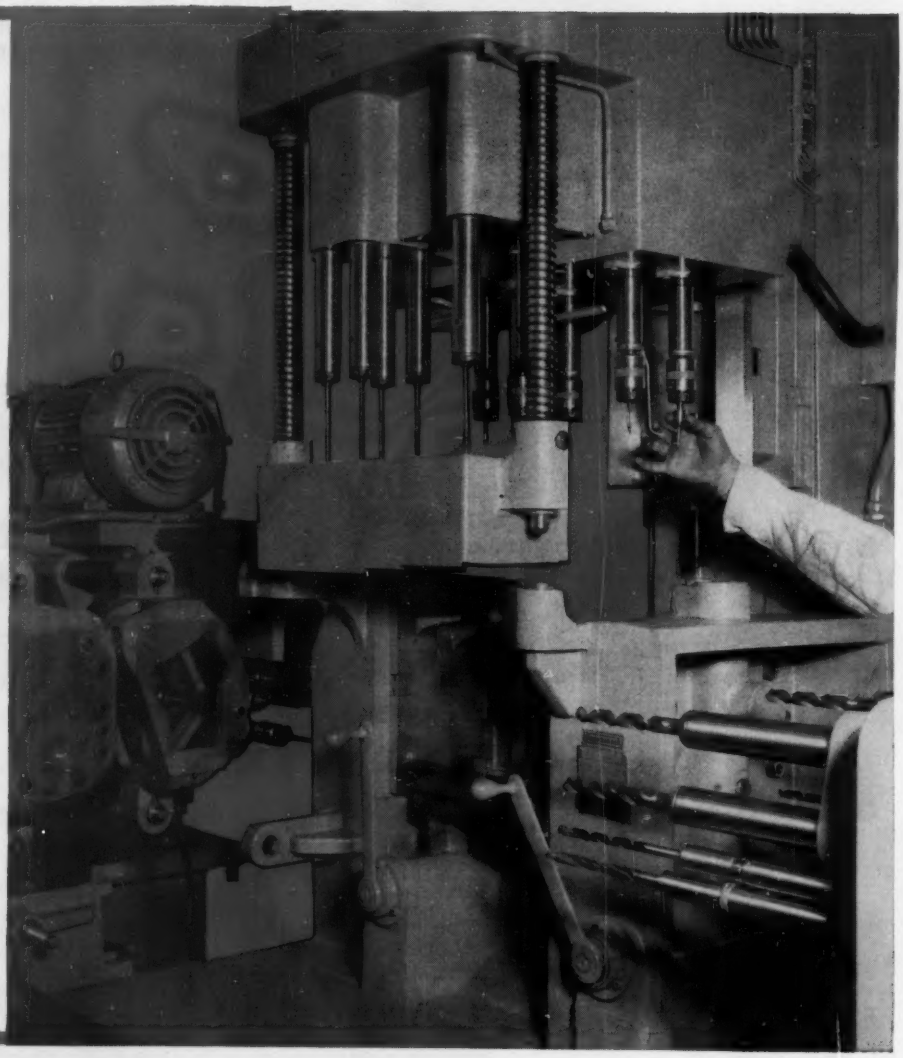
Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushma
Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaw

SCULLY JONES

"JT" Floating Holders lock provide

"Lock and Eject" design—threaded nut on nose of holder revolves freely on ball bearings, drawing threaded chuck into taper seat and compressing it evenly on shank of cutting tool. Chuck and cutting tool may be ejected separately or together by reversing rotation of threaded nut. Spanner wrench holes permit easy tool changes, even in close cluster of spindles.





BARNESDRIL uses "JT" Lock and Eject Collet-Type Floating Holders for fast tool changes

Barnes Drill Co., Rockford, Ill., produced this special 3-position drilling and tapping machine for a large tractor manufacturer. Center section frames of grey iron are machined at a rate of 22 per hour. The hydraulic lateral indexing table moves from loading position to drilling then tapping positions. Scully-Jones "JT" Lock and Eject Floating Holders were specified because of precision design, positive collet action, and free floating operation.

and eject tools faster, easier positive collet action with free float!

More and more machine tool manufacturers are equipping their machines with Scully-Jones Precision Holding Tools to assure optimum performance. They know that use of Scully-Jones holding tools is a positive step in the reduction of over-all tooling costs through simplified operation, reduced down-time, and improved production.

The Scully-Jones "JT" Lock and Eject Collet-Type Floating Holder has proved its value in applications to standard and special machine tools. This floating holder compensates for any misalignment between tool and work on multiple-spindle operations, simplifies and speeds tool changes, and gives a true, powerful collet action on taps and reamers. The lock and eject type chuck permits easy, rapid tool changes by simply turning the threaded ball bearing nut on nose of holder. The chuck and cutting tool may be ejected separately or together, more quickly and efficiently than ever before! The threaded nut stays on the holder and eliminates need for a drift.

Small body diameter permits close center work, while the shortness of the body projection requires minimum overhang between spindle and work. A quick-lock nut on the adjustable shank provides speedy, accurate adjustment.

Scully-Jones "JT" Floating Holders are available with adjustable adapter shanks, straight shanks, and ASA or Morse taper shanks. Chucks are made for these holders for drills from 1/16 to 3/4 in., reamers from 1/8 to 31/32 in., and for taps from No. 0 to 1 in. sizes.

Call your Scully-Jones factory-trained representative or distributor for assistance in any tooling problems you encounter.

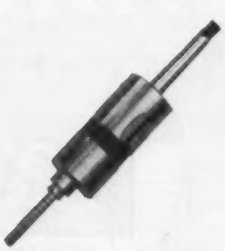
SCULLY JONES

Scully-Jones and Company, 1906 So. Rockwell St., Chicago 8, Ill.

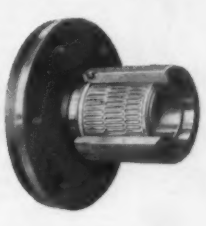
THERE'S A SCULLY-JONES PRECISION TOOL FOR EVERY HOLDING AND DRIVING NEED

Recessing Tools
Adjustments for locating and controlling depth of groove automatically are precise and fast.

Tap Chucks
Save costly setup time. Eliminate bell-mouthed and oversize tapped holes. True collet action on shank of tap.



Floating Holders
Give unrestricted float. Reduce scrap and tool breakage caused by misalignment of tool with work.



"Roll-Lock" Chucking Tools
Positive method of creating accurate, centering shrink fit to grip outside or inside diameter of work or tool.

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVES
See Discs, Abrasive

ABRASIVES, HONING
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

ABRASIVES, Polishing, Tumbling, Etc.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Macklin Co., 2925 Wildwood Ave., Jackson, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

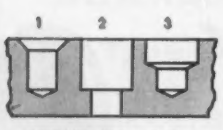
ACCUMULATORS, Hydraulic
American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farrel-Birmingham Co., Inc., 25 Main St. Ansonia, Conn.
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.

A NEW CONCEPT!

MOHAWK
Size-Optional
SUBLAND

Believing that there is too great a void between standard and special tooling, Mohawk has designed and developed a semi-standard subland tool.

The Mohawk Size-Optional Subland is machined, hardened and placed in a stock bin. This results in a material saving to the customer in set-up costs, reduces delivery time to a fraction of that usually required for special tools, and allows a tremendous reduction in inventory. In ordering these Size-Optional Sublands, the customer is limited only in relation to shank specifications, and partially on overall length requirements. Diameters and step lengths are completely optional to fit the particular application. Write for full details.



SUBLAND DRILL (2-2)
(1) Drill—Chamfer
(2) Drill—Counterbore
(3) Drill—Drill

NORMAL DELIVERY
1 WEEK
FROM RECEIPT OF ORDER

Mohawk
TOOLS, Inc.
910 E. MAIN ST., MONTPELIER, OHIO

worlds largest producer of Sublands

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature
Firth Sterling Inc., 3113 Forbes St., Pittsburgh

ALLOYS, Non-Ferrous
American Brass Co., 25 Broadway, New York
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ALLOYS, Zinc
New Jersey Zinc Co., 160 Front St., New York, N. Y.

ARBOR PRESSES
See Presses, Arbor

ARBORS AND MANDRELS
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., Milwaukee, Wis.
Le Count Tool Works, Inc., 390-L Capitol Ave., Hartford, Conn.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page* 288)

Machines too, develop through EVOLUTION

LEES-BRADNER

Proudly announces the latest developments in the model 7 type HD *high speed production hobbing machine*

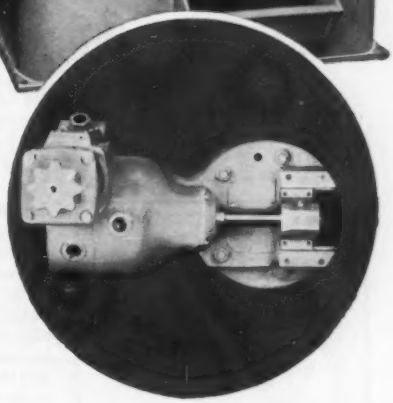
Just as given species improve, giving way to the constant press of nature, so do machines change and improve with the ever-increasing demands of industry.

The Lees-Bradner 7 HD Single Spindle Hobber is a good example. It has moved forward in engineering and design improvements to meet today's and tomorrow's production demands.

Pioneers in high speed hobbing, The Lees-Bradner Company has, through constant experimentation, created a hobbing machine far superior to its prototype. The new Model 7 Type HD Single Spindle Hobbing Machine offers industry a heavier and faster machine. Weighing approximately 1,000 lbs. more than its predecessor, it has a heavier headstock, heavier column, 10 H. P. motor and 2 H. P. rapid traverse motor.

Designed-in improvements such as these give industry savings in time and labor while meeting today's production demands . . . plus the extra capacity for tomorrow's requirements.

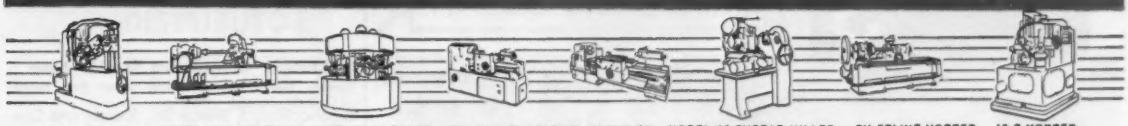
Demonstrations may be arranged on request. Contact your Lees-Bradner representative, or write us direct. No obligation, of course.



The above photographic close-up shows the new, heavier hob head with Timken bearing construction and 3-inch hob shift and new outer support.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U. S. A.



MODEL R HOBBER · HT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

. . . Why don't they get
WING Revolving Heaters?

Are your workers subjected to steady blasts of heat from suspended unit heaters with fixed discharge outlets? Are some uncomfortably hot while others are just as uncomfortably chilled? Wing Revolving discharge unit heaters are the logical solution to these important personnel problems. The heated air is discharged from slowly revolving outlets and this warm air stream caresses the workers in its circular path for a few seconds at a time, just enough to give a sensation of live, invigorating warmth.

Factories heated by Wing Revolving Heaters are pleasant places to work. Convince yourself—try one.

Write for a copy of Bulletin HR-6A. Use the coupon.

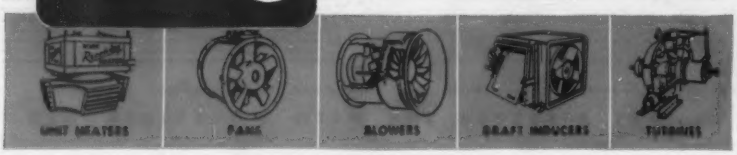
L. J. Wing Mfg. Co. 183 Vreeland Mills Road, Linden, N. J.

Factories: Linden, N. J. & Montreal, Can.
In Europe: WANSON, Haren-Nord, Brussels, Belgium

L. J. Wing Mfg. Co., Linden, N. J. MA-10
Please send me Bulletin HR-6A-Revolving Heaters

Name.....
Firm.....
Address.....
City.....Zone.....State.....

Wing



BABBITT
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Cosa Corp., 405 Lexington Ave., New York 17.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Olsen, Tinius, Testing Mch. Co., Willow Grove, Pa.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Pope Machinery Corp., Haverhill, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mich. Tool Co., 2531 11th St., Rockford, Ill.

BALL BEARING TESTERS
Micrometrical Mfg. Co., 321 S. Main St., Ann Arbor, Mich.

BALLS
Kennametal, Inc., Latrobe, Pa.

BARS, Phosphor Bronze
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

BARS, Steel
Allegheny Ludlum Steel Corp., Bethlehem, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded
Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

BEARINGS, Babbitt
Bunting Brass & Bronze Co., Spencer and Carlton Ave., Toledo, Ohio.

BEARINGS, Ball
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
New Departure Div., General Motors, Bristol, Conn.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.

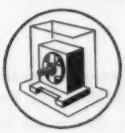
BEARINGS, Bronze and Special Alloy
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Ave., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

(*Continued on page* 290)

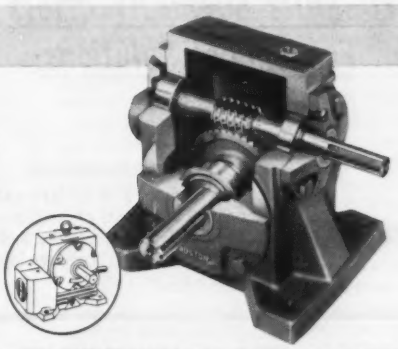
THE NEW BOSTON GEAR 100 SERIES SPEED REDUCTION UNITS

Every feature you want- any model you need - *FROM STOCK*

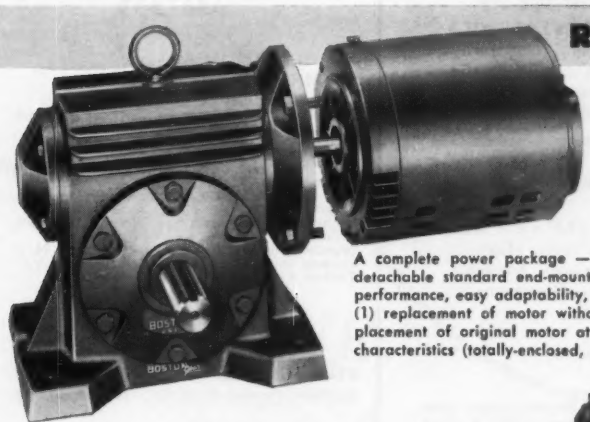
REDUCTORS



CERTIFIED ratings
NEW space-saving design
NEW clean contours
NEW gearing efficiency
NEW cooling fins
FAN-COOLING optional on larger sizes



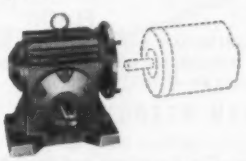
RATIOMOTORS



— all new features of Reductors plus NEW *Combination* CONSTRUCTION

A complete power package — gear reduction unit and easily detachable standard end-mounted motor — combined for peak performance, easy adaptability, big maintenance savings. Permits (1) replacement of motor without disturbing gear unit. (2) Replacement of original motor at any time with motor of special characteristics (totally-enclosed, etc.).

FLANGED REDUCTORS The Ratiomotor gear reduction unit, supplied *without* motor. You buy and attach the motor of your own choice.



Certified MAXIMUM HORSEPOWER PER DOLLAR

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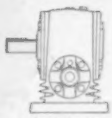
for complete information — or write:
Boston Gear Works, 65 Hayward Street,
Quincy 71, Massachusetts.

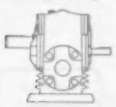
NEW CATALOG
R-56
gives complete details, selection charts, engineering data. Get your copy.



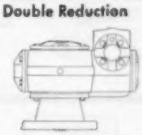
Horizontal Right Angle Drive Worm gear on top

Horizontal Right Angle Drive Worm gear under

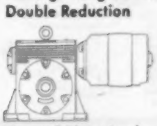
Vertical Right Angle Drive



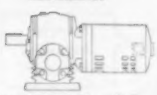
Horizontal Parallel Drive Double Reduction



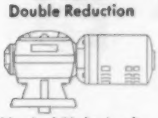
Vertical Right Angle Drive Double Reduction



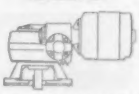
Horizontal Right Angle Ratiomotor



Horizontal Parallel Ratiomotor Double Reduction



Vertical Right Angle Ratiomotor



Vertical Right Angle Ratiomotor Double Reduction

PATENTS APPLIED FOR
108
MODELS
1064
STANDARD STOCK UNITS

Look under "GEARS in the Yellow Classified Section of your Telephone Directory for the BOSTON Gear Distributor nearest you. 55 BG-R-13

SHIMS

BRING YOUR SHIM PROBLEMS TO EXPERIENCED SPECIALISTS

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Only LAMINATED SHIM COMPANY Offers These Efficient, Economical Solutions:

THE LAMINUM® SHIM

SIMPLY PEELS FOR ADJUSTMENT

Made up of from 3 to 63 layers of .002 or .003 inch brass or steel, metallically bonded together over their entire surfaces. No dirt between layers. Peels with penknife.

THE LAMISOL® SHIM

FOR QUICK, ASSEMBLY LINE USE

The laminations of the LAMISOL® Shim (in brass) are temporarily joined by spot-soldering on the edges. Gauges and number of laminations within one shim are unlimited.

PACKAGED SHIM STOCK

READY FOR EASY USE, WITHOUT WASTE

Thin gauge 6" x 100" rolls feed through package slots. Heavier gauges in flat envelopes. Available from your Industrial Distributor.

FLASH!

LAMINUM® and LAMISOL® Shims are now made of Aluminum – with all laminations surface bonded. Layers are of .003" Aluminum.

LAMINATED SHIM COMPANY, INC.

SHIM HEADQUARTERS SINCE 1913

Check Our Stampings Division For Your Stamped Parts Requirements

MAIL TODAY!

LAMINATED SHIM COMPANY, INC.
3910 UNION STREET, GLENBROOK, CONN.

Please send me more information on:

☐ SHIMS ☐ STAMPINGS ☐ BOTH

☐ *We'd like to discuss our problem with one of your Sales Engineers.*

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____

BEARINGS, Lineshaft
Fafnir Bearing Co., New Britain, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle
Orange Roller Bearing Co., Inc., Orange, N. J.

BEARINGS, Roller
Ball & Roller Bearing Co., Danbury, Conn.
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Self Lubricating (Oilless)
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Ave., Toledo, Ohio.

BEARINGS, Tapered Roller
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Thrust
Ball & Roller Bearing Co., Danbury, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearing Co., Inc., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.

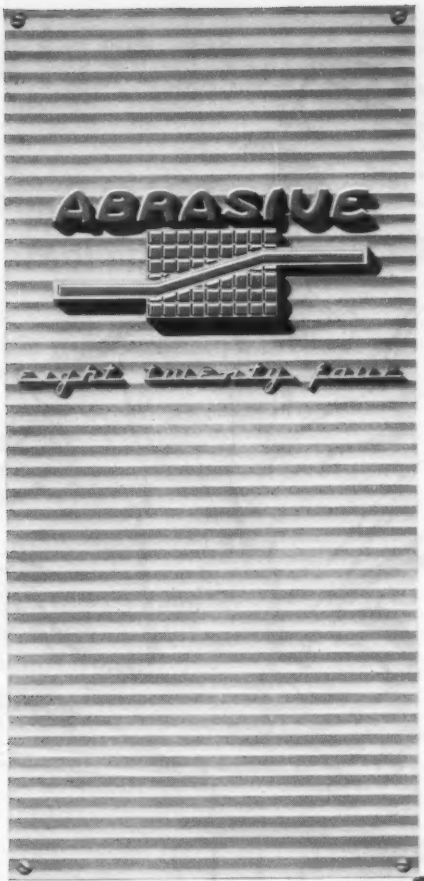
BELT SHIFTERS
Standard Pressed Steel Co., Jenkintown, Pa.

BELTING, Transmission
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

BENCHES, Work, and Bench Legs
Standard Pressed Steel Co., Jenkintown, Pa.

BENDING MACHINES, Angle Iron, Plate, Etc.
Consolidated Mch. Tool Corp., 656 Blossom Rd., Rochester, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy., Chicago, Ill.

(*Continued on page* 294)



You are going to see new things from ABRASIVE

The new Abrasive name plate above gives you a hint! In 1956, our fortieth anniversary, Abrasive will introduce a number of important developments in their well known line of surface grinders. For your greatest production year, keep your eye on Abrasive pioneering in 1956.

ABRASIVE
Machine Tool Company
Dexter Road, East Providence, Rhode Island

Sorry! We can't show this revolutionary new Abrasive in detail. Look for it in 1956.

For more information on products advertised, use Inquiry Card, page 243

How much did

ABSORPTION
is amazing . . .

"Perf-Embossed®" texture gives Scott Wipers their dirt-gripping, oil-drinking power

See our National Metal Show demonstration at Philadelphia's CONVENTION HALL
Booth 915 October 17-21

wiping cost you last month?

Switch to Scott Wipers—eliminate expensive handling, controls and lost production time . . . get more efficiency!

Add up your wiping costs for last month. What did you spend to count, sort, bale and launder wiping material? How much efficiency did you lose in distribution . . . in housekeeping . . . in production time?

New Scott Wipers—the strong, capable *disposable* wipers—put an end to all these inefficiencies, all these high cost "extras." But try the Scott Wiper yourself. Ask your local Scott salesman or distributor to help you set up a 90-day trial installation in your plant. Or mail this coupon today.

DISTRIBUTION
is simple . . .

The Dispenser-box is a portable supply of 125 wipers

And best of all, Scott Wipers are
DISPOSABLE!

SCOTT PAPER COMPANY
Dept. M-E, Chester, Pa.
Please send me full information on Scott Industrial Wipers.

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Company_____

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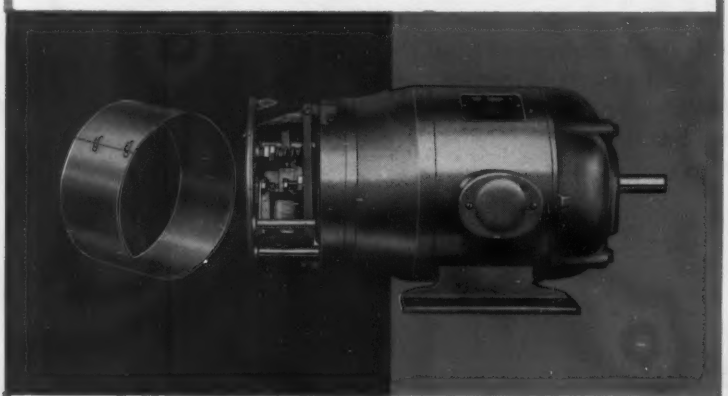
to MACHINE DESIGNERS, Howell suggests

What to look for in Brake Motors

Long-life braking action Durability in the brake means less maintenance on your machines. Howell's super tough friction disc is spline-mounted for extra strength. Push rod and rocker arm slots are heat treated to file hardness (60 Rockwell C).

Fail-safe operation protects machine and product in emergencies. In case of power failure, the Howell brake sets automatically. Brake is also equipped with hand-operated lever to permit manual braking.

Accessibility and Compactness The Howell brake has a wrap-around cover that removes in seconds for quick easy brake adjustment. Because cover removal requires no end clearance, the Howell brake takes up minimum space.



NEMA-Standard motors give machine builders and users complete motor interchangeability, help them reduce inventories and simplify purchasing. Howell gearmotors give you this valuable feature — with the new re-rated motors included!

Fully-protected bearings insure longer motor life. Dirt can't enter Howell's double-shielded bearings either from inside or outside the motor, because they are sealed in the end-plate cavities by dust-tight inner caps.

Copper-clad rotors mean better heat conductivity, stability at high temperatures and, as opposed to die-cast rotors, greater design flexibility to meet your particular motor requirements. All Howell motors have them.

Howell brakes are torque rated for up to 50 lb. ft. for continuous duty; up to 75 lb. ft. for intermittent duty.

Shown left are two of many possible mechanical variations: a vertical C-face mounting and a unit incorporating the super-compact Howell disc motor.

WRITE FOR BULLETIN BR-2

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.
Precision-built motors for industry since 1915

HOWELL Red Band MOTORS

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 30 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy., Chicago, Ill.

BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy., Chicago, Ill.

BLAST CLEANING EQUIPMENT

Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pangborn Corp., Hagerstown, Md.
Wells Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

BLUING LAYOUT

Dykem Co., 2303P. N. 11th St., St. Louis 6, Mo.

BOILER TUBES

Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Joseph T., & Son. Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLTS AND NUTS

Bethlehem Steel Co., Bethlehem, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

BOOKS, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

BORING AND DRILLING MACHINES

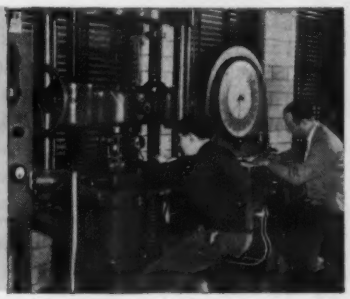
Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio

(*Continued on page* 296)

For more information on products advertised, use Inquiry Card, page 243

Vanadium-Alloys Steel Company

• advanced research

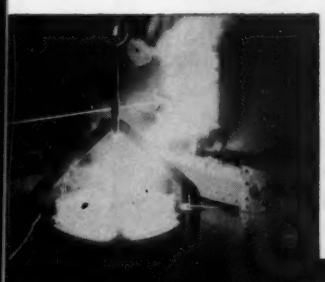


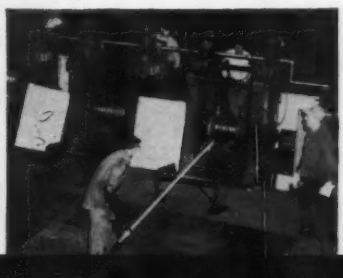
the facts behind

first quality

in tool steels—*and in service!*

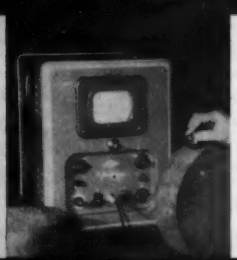
Pictured here are some of the tangibles that assure First Quality in Vanadium-Alloys Steel Company products. Above these modern facilities, however, is the calibre of the men who operate them—men whose experience, in many cases, is as old as the Company—and men in every case whose talents are devoted solely to the production of fine Tool Steel *and nothing less.* Visit us, and see for yourself. We welcome every opportunity to serve you.



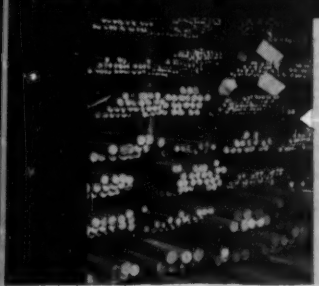


• careful melting
• thorough forging
• accurate rolling

• complete inspection



• Deep Etch • Supersonic • Spectrographic • Pyrometric • Zyglo • Magnaflux



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Latrobe, Pennsylvania

COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.

In Canada: Vanadium-Alloys Steel Canada Limited, London, Ontario

ONLY

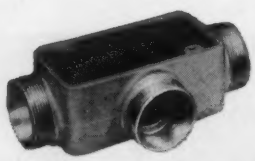
GOSS and DeLEEUW AUTOMATIC CHUCKERS

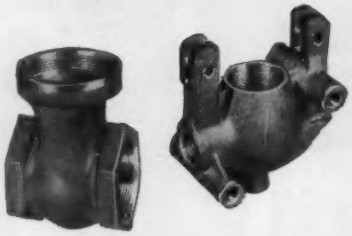
offer the **1-2-3** *feature*

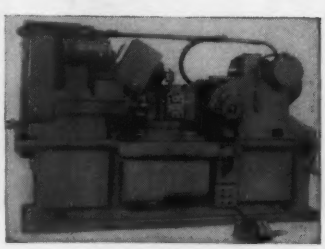
This NEW development—unsurpassed for speed, convenience of tooling and precise finish—involves no retooling problem even for short runs. It assures greater production at lower cost on all classes of work.

The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.

Here's an ideal machine tool for small lot requirements because of quick, easy changeover. Any class of chuck work can be handled economically in any quantity.







The examples of work shown here are typical of the wider variety of parts being produced on these new machines.

SEND FOR detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Wales-Strippet Corp., North Tonawanda, N. Y.

BORING AND TURNING MILLS, Vertical

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

BORING BARS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero 50, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BORING, DRILLING AND MILLING MACHINES, Horizontal

(Floor, Planer or Table Types)

Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Innocenti Corp., 43 W. 61st St., New York 23, N. Y.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Portage Machine Co., 1069 Switzer Ave., Akron 11, Ohio.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

BORING HEADS

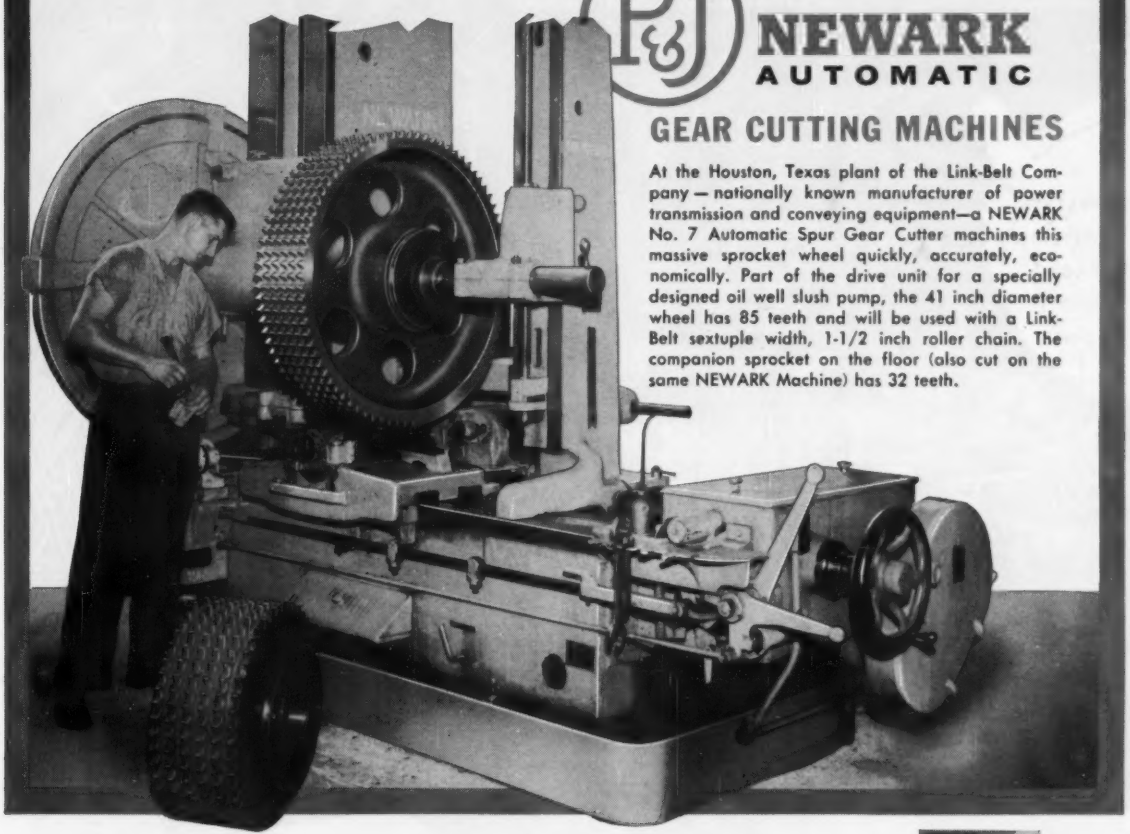
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.

(*Continued on page* 300)

Specialists who KNOW rely on

P&J NEWARK AUTOMATIC

GEAR CUTTING MACHINES



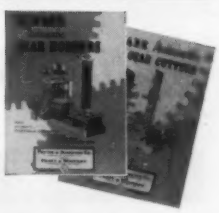
At the Houston, Texas plant of the Link-Belt Company — nationally known manufacturer of power transmission and conveying equipment—a NEWARK No. 7 Automatic Spur Gear Cutter machines this massive sprocket wheel quickly, accurately, economically. Part of the drive unit for a specially designed oil well slush pump, the 41 inch diameter wheel has 85 teeth and will be used with a Link-Belt sextuple width, 1-1/2 inch roller chain. The companion sprocket on the floor (also cut on the same NEWARK Machine) has 32 teeth.

POTTER & JOHNSTON-NEWARK

Assets of the Newark Gear Company have recently been acquired by **POTTER & JOHNSTON**, subsidiary of Pratt & Whitney, Division Niles-Bement-Pond Company. In addition to the complete line of P&J Automatic Turret Lathes, these long-famous automatic gear machines are now being manufactured in our Pawtucket, Rhode Island plant, and are made available through Pratt & Whitney factory-direct representatives.

SEND NOW FOR COMPLETE INFORMATION

P & J NEWARK Automatic Gear Hobbers and Spur Gear Cutters produce helical and herringbone gears, worm wheels and spur gears accurately and economically; they are easy to set up and operate. Several models are manufactured to handle a very wide range of work requirements. Product literature—including complete specifications and engineering data—is yours for the asking. Write on your Company letterhead direct to Pawtucket outlining your requirements . . . or simply phone the Pratt & Whitney Branch Office nearest you.



POTTER & JOHNSTON CO.

PAWTUCKET, RHODE ISLAND
SUBSIDIARY OF
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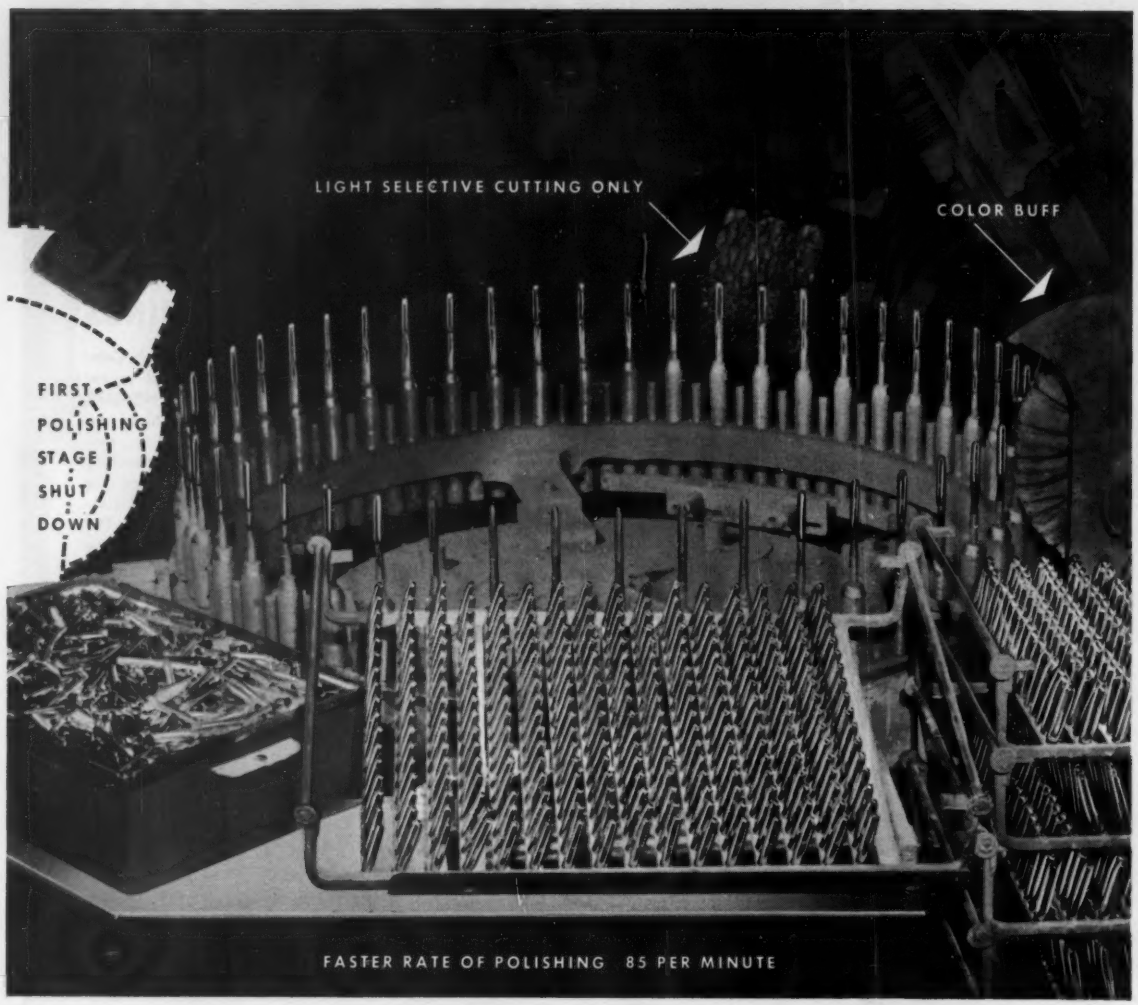
PRECISION PRODUCTION TOOLING — FOR MORE THAN FIFTY YEARS



How Formbrite cuts polishing costs 40% for JARCO

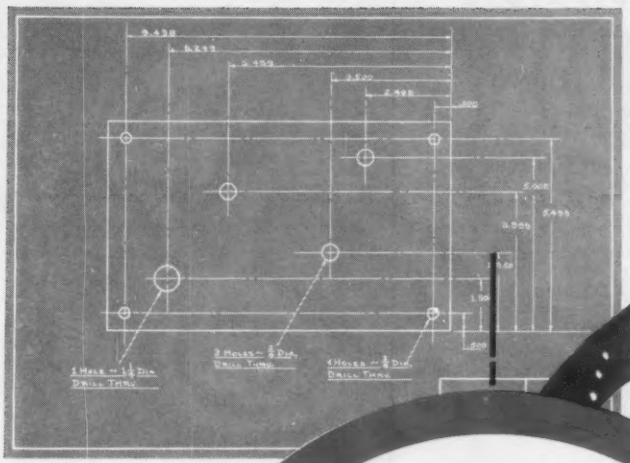
Pens, pencils, and lipstick cases have to be attractive to sell—yet they must be able to take a beating in daily use. The Jarco Metal Products Co., which specializes in drawing metal parts for these and such other products as miniature flashlight cases, and similarly formed products, tried Formbrite,® Anaconda's new drawing brass, shortly after it was announced to the trade.

Superior polishing characteristics combined with excellent drawing properties, plus hardness and scratch resistance, sounded ideal for Jarco products. Formbrite has proved an excellent pressroom material. The uniformity of temper from batch to batch eliminated shutdowns for adjustments in their battery of 12-plunger Waterbury-Farrel presses, which can produce up to 500,000 pieces a day.

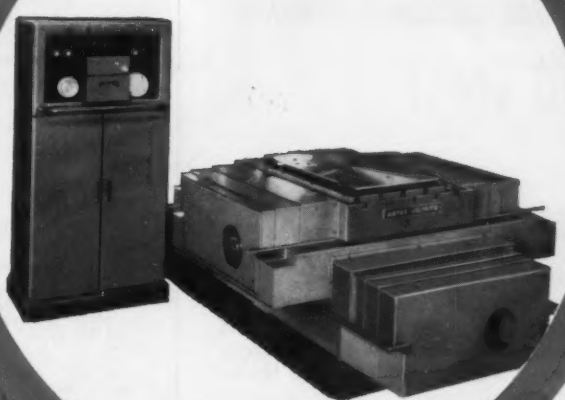
It's in the polishing room where Formbrite has really paid off. Jarco uses 50- and 98-spindle continuous-loop machines having two cutting stages and a final color buff stage. The first cutting stage is shut down completely. The second stage is used for only a partial or selective cut in certain areas of the cap—because of the extremely deep draw. The color buff stage does most of the work. The savings in polishing run about 40%, according to David Roberts, vice president.

Formbrite is a premium product at a nonpremium price. Find out for yourself how its superfine grain, excellent drawing properties, strength, and scratch resistance can help you make a better product at lower cost. Write for Publication B-39. Better yet, ask about a sample or a trial batch. Write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

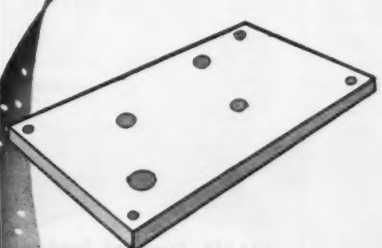
Formbrite
FINE-GRAIN DRAWING BRASS
an ANACONDA® product
made by
The American Brass Company



this tape will save you $ thousands per year



the ARTER JIGMATIC



AUTOMATIC, TAPE CONTROLLED POSITIONING FOR VERTICAL DRILLING

From blueprint to finished piece — it's all in the tape! Your engineering department punches the tape for desired hole locations. All your operator need do is push the "Position" button, then drill the holes. Costly set-up time is practically eliminated. There are no jigs or fixtures; no stops to set. Savings in set-up time alone amount to thousands of dollars per year.

Write for Bulletin M 55b

ARTER grinding machine company WORCESTER, MASS.

ACCO products

Wilson Diamond "Brale"* Penetrators

Why only a "BRALE" insures accurate hardness testing of hardened steel

A FULL LINE TO MEET EVERY HARDNESS TESTING REQUIREMENT

"ROCKWELL" Fully Automatic Hardness Tester
•
"ROCKWELL" Semi-Automatic Hardness Tester
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"ROCKWELL" Regular Hardness Tester
•
"ROCKWELL" Special Hardness Tester
•
"ROCKWELL" Superficial Hardness Tester
•
TUKON Micro & Macro Hardness Tester

• Only with the high degree of accuracy built into a WILSON "Brale" Diamond Penetrator can you meet the requirements of a hardness test where one point of hardness represents a depth of only 0.00008".

These sphero-conical penetrators are made from carefully selected diamonds, ground to mathematical precision with microscopic accuracy and standardized on test blocks in the WILSON Laboratory. Each is proof-tested under heavy load.

Special "Brale" Penetrators for testing unique areas—such as the pitch line of gears, or for high temperature testing—are available on request. N "Brale" Penetrators are supplied for use with WILSON "Rockwell"* Superficial Testers.

There is a WILSON "Rockwell" Hardness Tester for every requirement—including the WILSON "TUKON" for micro-indentation testing. WILSON experts are available to consult on hardness testing requirements. Write or call today.

*Trade mark registered

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AMERICAN CHAIN & CABLE
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for Better Value

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Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Mummert-Dixon Co., Hanover, Pa.
Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero 50, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

Bryant Chucking Grinder Co., Springfield, Vt.
Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
National Automatic Tool Co., Inc., S 7th and N. Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kearney & Trecker Corp., Milwaukee, Mis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Wales-Strippet Corp., North Tonawanda, N. Y.

BORING TOOLS

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
The Afrax Co. (Carbide) 240 Day St., Newington 11, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth-Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York., N. Y.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero 50, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago, 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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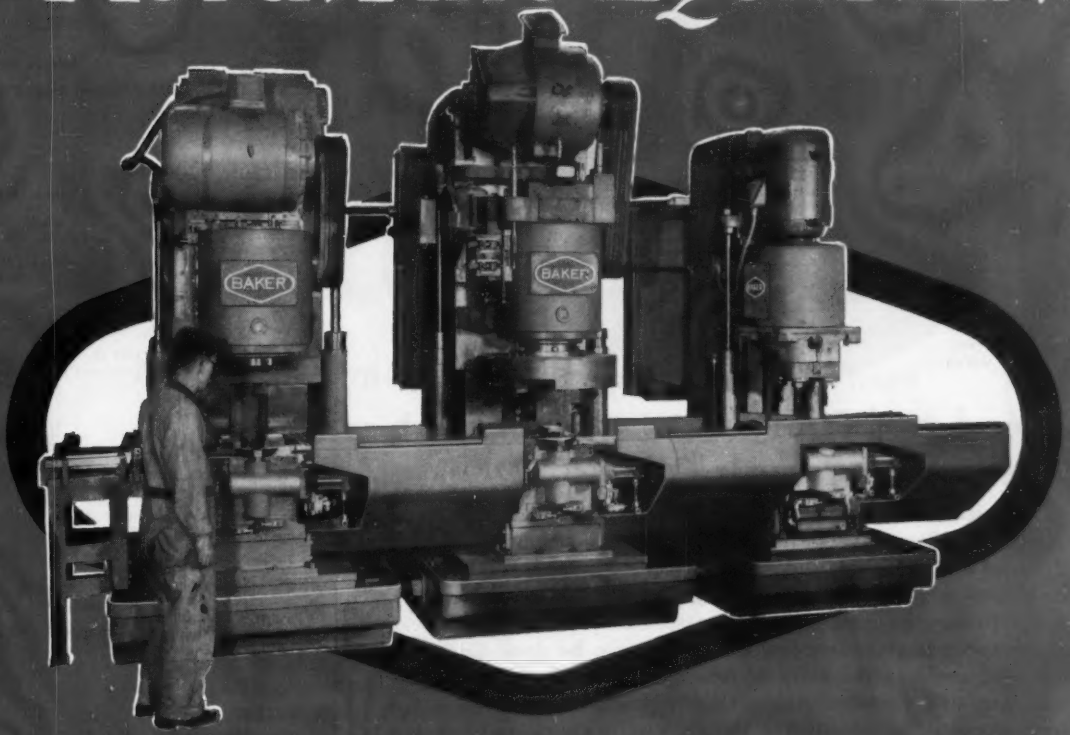
(*Continued on page* 302)

For more information on products advertised, use Inquiry Card, page 243

The Average Shop Needs and Now Can Afford

AUTOMATIC EQUIPMENT



The new three standard unit Baker Machine introduced at the show, is combined to operate as a transfer machine, set up with a low cost, simplified fixture, proving the possibility of providing automatic machines through use of STANDARD MACHINES . . . And thereby achieving automation without tremendous expenditure. Operations on the new Baker Transfer are Combination Bore & Counterbore . . . Face (cross feed) . . . and Multiple Drill . . . All Automatically. Write regarding your specific job problems.

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BAKER BROTHERS, INC.

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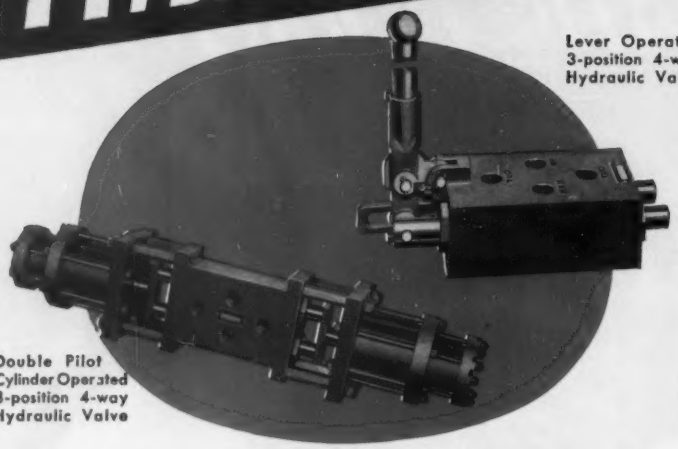
Quick-As-Wink® HYDRAULIC VALVES



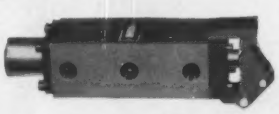
Lever Operated 3-position 4-way Hydraulic Valve

Double Pilot Cylinder Operated 3-position 4-way Hydraulic Valve

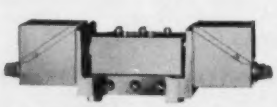
Hand and Pilot-operated Types for Water or Hydraulic Oils to 5000 psi.

• Quick-As-Wink Hydraulic Control Valves meet the most exacting requirements. These valves are fully balanced in any position. Patented design includes hydraulically balanced U-packers. Packers are floated while crossing the valving ports, thus assuring long life, and expanded by internal valve pressure to provide a tight seal. Maintenance is extremely low and usually can be done quickly in the field, avoiding the delay of returning valves to the factory for servicing, or the need of maintaining large standby inventories. For long, dependable, trouble-free service, specify Quick-As-Wink Hydraulic Valves. Write for Bulletin No. 531 and the fully descriptive Data Sheets. They give complete details. Write *today!*

Ask us also about . . .

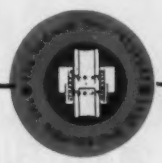


CAM OPERATED SINGLE PLUNGER VALVE 3/8" to 3/4" sizes. Operated by rotating cam or land on reciprocating device.



DOUBLE SOLENOID "O-TYPE" VALVE for pressures up to 125 psi. Widely used as pilot valves and for operating air cylinders.

Quick-As-Wink®
AIR AND HYDRAULIC
Control Valves



Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

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Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

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Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Detroit Broach Co., Detroit, Mich.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Shearcut Tool Co., Reseda, Cal.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

American Broach & Mch. Co., Ann Arbar, Mich.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Detroit Broach Co., P. O. Box 156, Rochester, Mich.
Foote-Burt Co., 130 St. Clair Ave., Cleveland 8, Ohio.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.
Zagar Tool Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BRONZE

American Brass Co., Waterbury 20, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Mueller Brass Co., Port Huron 35, Mich.

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Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.
Pittsburgh Plate Glass Co., Brush Div., Baltimore 29, Md.

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Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

BURS

See Files and Burs, Rotary

BUSHINGS, Brass, Bronze, Carbide, Etc.

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York
Kennametal, Inc., Latrobe, Pa.

(*Continued on page* 304)

NOW

a high-speed Quenching Oil that gives all-purpose performance

Here's why metal-working plants everywhere are changing to Shell Voluta Oil 23

1. **High cooling rate through the critical temperature range.** To develop maximum physical properties, various carbon and low alloy steels require higher cooling rates than provided by conventional mineral type quenching oils. Shell Voluta Oil 23, because of its initial cooling rate, helps develop these desired properties in such steels.

2. **Versatility of Use.** Shell Voluta Oil 23, because of its high cooling rate, helps to obtain uniform properties with any steel of variable hardenability. It works equally well at normal (120-150°F) oil temperatures and in hot-quenching operations with oil up to 250°F.

Quenching from cyanide into Shell Voluta Oil 23 gives exceptionally clean part surfaces . . . often eliminates the need for after-quench cleaning.

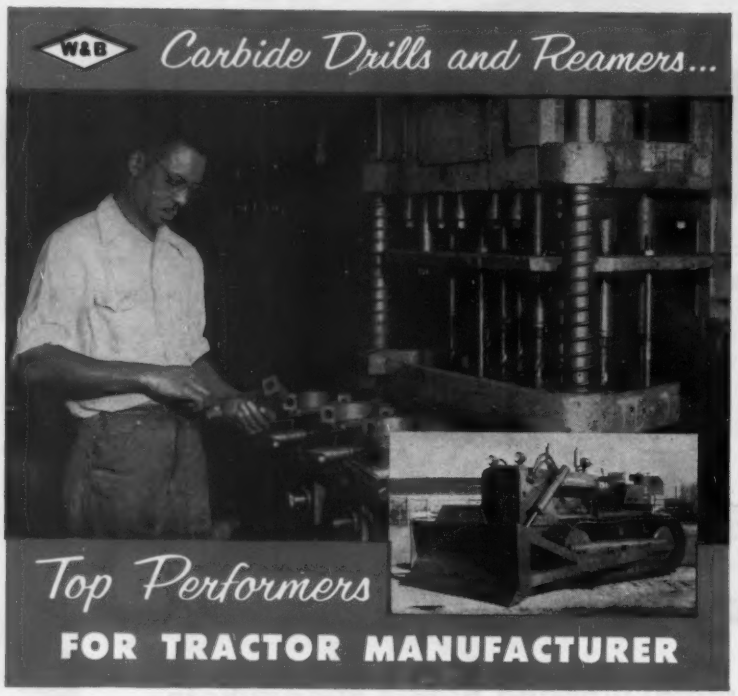
The cooling rate of Shell Voluta Oil 23 is high through the critical range, while its rate of cooling during martensitic transformation is essentially that of conventional oil. This combination is ideal for minimizing distortion tendencies.

3. **Stability in Service.** Extreme resistance to sludging and viscosity change has been achieved through the careful selection of well-refined base stocks and the use of special additives. Shell Voluta Oil 23 stays the same physically AND retains its high cooling rate. *Write for further details.*

SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL



Whitman and Barnes drills and reamers are used on many tough production operations by a well known tractor manufacturer to secure more pieces per hour, more holes per grind and longer tool life. Illustrated above is an operation utilizing carbide drills on cast iron crankshaft bearing caps. These standard 13/16" diameter W & B carbide drills are run at 290 R.P.M. and a feed of 2-1/8" per minute. It was found that high speed steel drills burned badly on this job with resulting short life. Comparatively, W & B carbide drills not only provided more holes per grind, thereby reducing down time, but increased tool life to over 10,000 holes, 2-1/2" deep. For top performance and rock bottom costs in drilling and reaming you can't beat W & B.

4282

Call your W&B distributor for best service and highest quality

He can save you money by supplying from his stock . . . what you need when you need it!

"Makers of Fine Tools Since 1848"

DRILLS, REAMERS COUNTERBORES W&B CARBIDE TOOLS, SPECIAL TOOLS

Please send me additional information

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COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

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PLYMOUTH ROAD • PLYMOUTH, MICHIGAN

NEW YORK • CHICAGO • LOS ANGELES • ATLANTA

BUSHINGS, Hardened

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Leland-Gifford Co., 1925 Southbridge St., Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, Pa.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

BUSHINGS, Jig

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

CALIPERS

Ames, B. C., & Co. (Dial) Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starret, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

CAM CUTTING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Sunstrand Machine Tool Co., 2351 11th St., Rockford, Ill.

CAM MILLING AND GRINDING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.
Orban Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rowbottom Machine Co., Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Machry. Co. 287 Homestead St., Hartford, Conn.
Rowbotton Machine Co., Waterbury, Conn.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

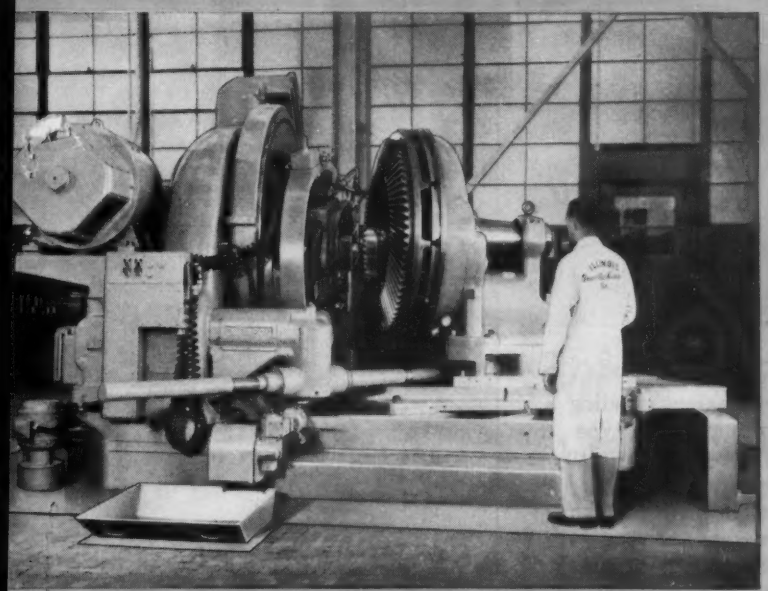
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Jarvis Corp., Middletown, Conn.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wesson Metal Corp., Lexington, Ky.
Willey's Carbide Tool Corp., 1340 W. Vernon Hwy., Detroit 1, Mich.

CASEHARDENING FURNACES

See Furnaces, Heat-Treating

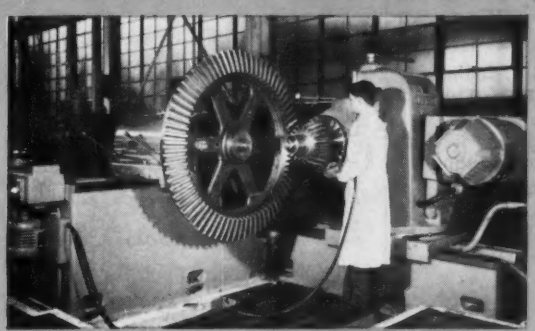
(*Continued on page* 306)

BIG SPIRAL BEVEL ZEROL BEVEL HYPOID GEARS

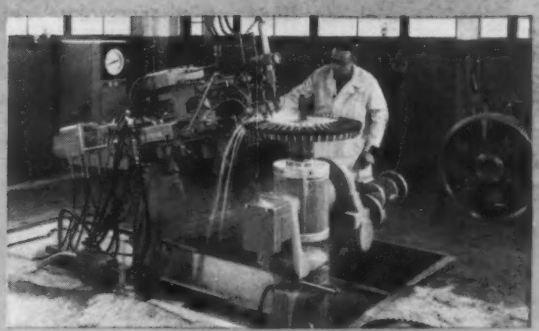


PRECISE GENERATION OF BIG BEVEL GEARS

This new No. 170 Spiral Bevel and Hypoid Gear Generator is the nucleus of the most modern and productive unit of large bevel gear generating machinery in the world. It generates spiral bevel, zerol bevel, and hypoid gears to 72″ diameter, 2.875″ tooth depth (.75 D.P.), 10″ face, and 10″ hypoid pinion offset above or below centers. The localized gear tooth bearing, an established necessity for today's heavily loaded gear drives, is precisely controlled to your specifications.



POWER TESTING—This new No. 61 Angular Hypoid Testing machine is the most advanced of its kind. Large spur, helical, herringbone or bevel gears are operated under load at any shaft angle, giving exact inspection of tooth contact under operating conditions. It will efficiently test gears up to 90″ diameter and hypoid offsets to 10″ above or below centers.



SURFACE HARDENING—This new No. 2 Flame Surface Hardening machine is closely controlled electronically to produce precise, uniformly distortion-free results—it's the all important climax to our large gear production facilities. Spur, helical, bevel and hypoid gears to 120″ diameter, .75 D.P., and 18″ face are surface hardened in this machine.

Visit our modern plants—see the finest equipped plants in the world—designed to serve you.

Look for this mark ILG ... the symbol on finer gears

ILLINOIS GEARS Reg. U.S. Pat. Off.

Gears for Every Purpose ... one gear or 10,000 or more

ILLINOIS GEAR & MACHINE COMPANY

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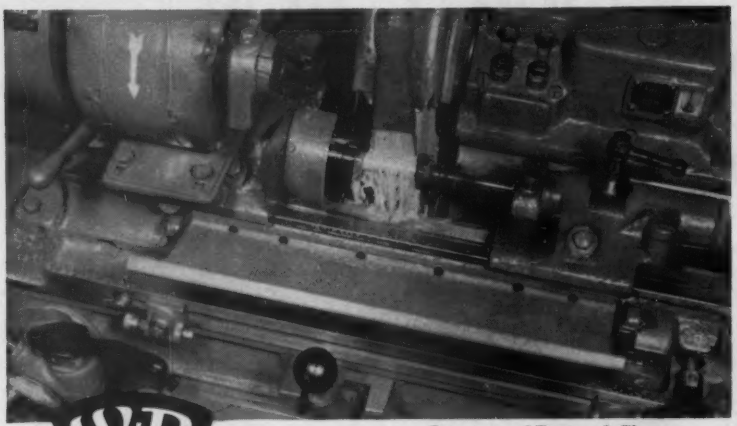


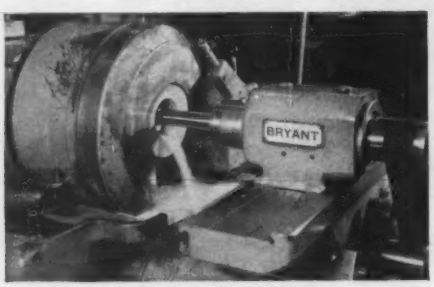
Courtesy of Brown & Sharpe

W+B INDUSTRIAL LUBRICANTS

PACING THE INDUSTRY IN METALWORKING LUBRICANTS

Out of the W & B Labs. have streamed a long succession of metalworking lubricants: transparent grinding and cutting coolants . . . paste-form and fluid-type water solubles . . . concentrated bases to blend and fortify metalworking lubricants . . . oils for critical grinding, honing . . . and dozens of others. You see, for more than 60 years W & B has stuck to its own particular last . . . developing lubricants to keep production and quality high, operating costs low, successfully, too.

Ask any top machine operator.



Courtesy of Bryant Chucking Grinder

Take W & B Grinding Concentrate 1500. This transparent water-soluble lubricant for grinding ferrous metals is used as thin as 200 to 1. Yet it keeps grinding wheels unusually open, settles chips almost instantly, stays virtually foam-free—is very economical.

Do *you* have a grinding or machine problem? Ask us, without obligation, to send a W & B Technical Representative. He'll be glad to help you. Simply use coupon below.

THE WHITE & BAGLEY CO.

105 FOSTER STREET • WORCESTER, MASS.

W+B INDUSTRIAL LUBRICANTS

Please send without obligation, a W & B Lubrication Expert to our plant for consultation.

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Company_____

Street_____

City_____ Zone_____ State_____

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Mueller Brass Co., Port Huron 35, Mich.

CASTINGS, Die

American Brass Co., Waterbury 20, Conn.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Madison-Kipp Corp., Madison, Wisc.

CASTINGS, Iron

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engineering Co., Chambersburg, Pa.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel

Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTERING MACHINES

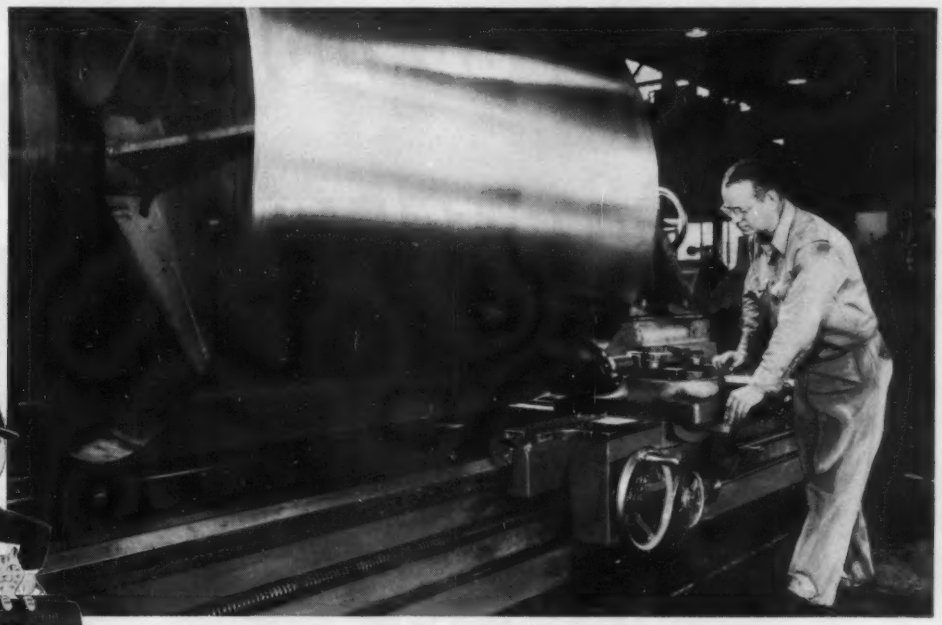
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CENTERS, Lathe

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page* 310)

Photo, courtesy Commercial Machining Company, Conway, Pa. Turning 60" dia. stainless steel looping line roll.



Mr. Tooley Says:

"There's more than one way to skin a cat"

CIRCLE "C"

SUPER HIGH SPEED STEEL

- Operating speeds 25%—50% faster than ordinary high speed steels
- Longer tool life
- Cuts costs by increasing production
- Particularly suitable for cutting tough alloy and stainless steels

FIRTHITE

STANDARD TIPS, TOOLS, INSERTS AND HOLDERS

- Highest metal removal rate
- Uniform, dependable Firthite quality and performance
- Large stocks of standard tools and tips for immediate delivery
- Mechanically-held and brazed designs

Yes, in the field of tooling, alternative cutting materials make it possible to utilize the same production equipment for a variety of applications. In typical turning operations either Firth Sterling High Speed Steel or Firthite Sintered Carbide cutting tools may be selected . . . depending upon the characteristics of the metal and the production requirements of the job.

Firth Sterling, manufacturers of complete shop tooling needs, occupies the unique position of providing *both* steels and carbides to "skin the cat" of production in the most economical and effective ways. Thus, from *one* dependable source of supply you are assured of (1) completely unbiased tooling recommendations and, (2) the selection of the exactly right carbide or steel or *both* to provide maximum production!

Both Firth Sterling's famous CIRCLE "C" Super High Speed Steel and FIRTHITE Sintered Carbide cutting tools and tips are used alternatively for most metal removal operations. Write now for literature and unbiased recommendations for your specific needs.

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PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels
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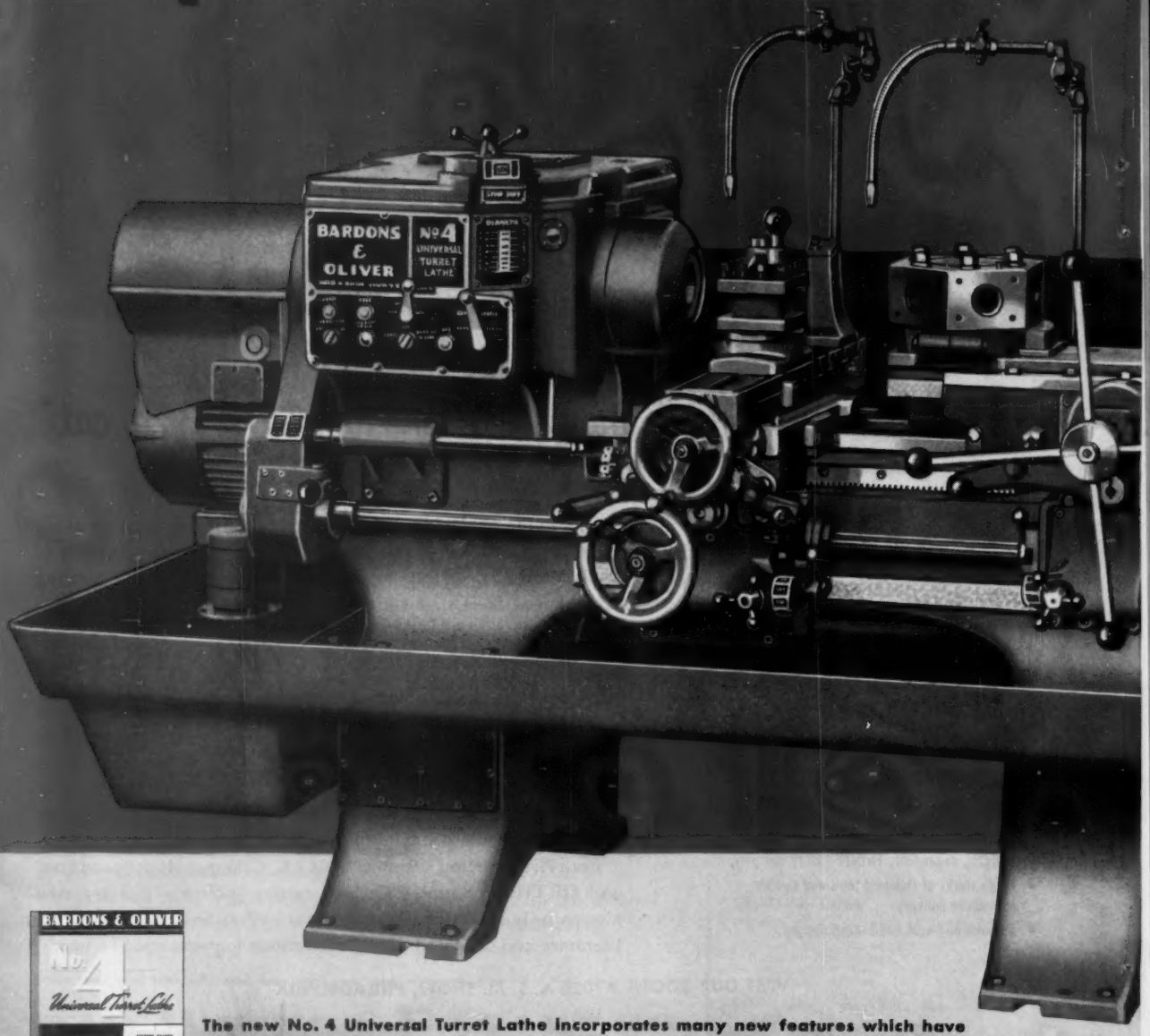
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets
Zirconium

CALL YOUR FIRTH STERLING DISTRICT OFFICE OR DISTRIBUTOR. ASK MR. TOOLEY.

THE NEW BARDONS & OLIVER

No. 4 Universal Turret Lathe...



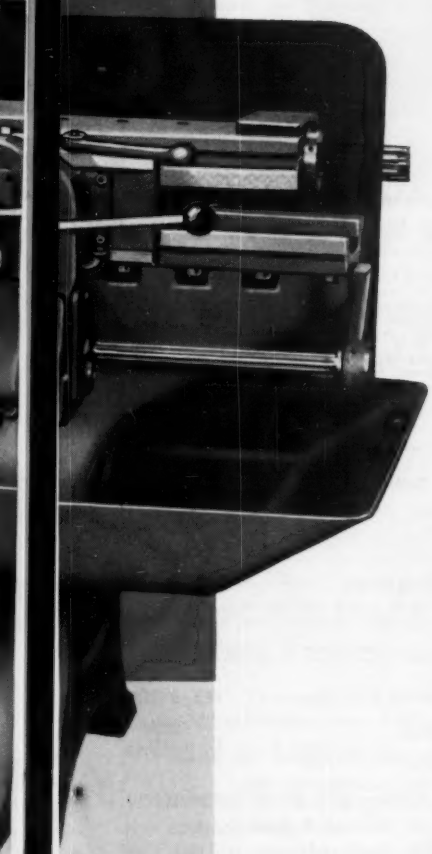
Write us on your company's letterhead for this new Catalog.

The new No. 4 Universal Turret Lathe incorporates many new features which have sharply increased its productive capacity while lessening the physical effort required of the operator.

A larger selection of spindle speeds, covers a wider overall range. Spindle speeds are instantly preselected and changed. Tool carrying stations have increased rigidity and accuracy. Controls are regrouped for handier and faster manipulation. Wider selection of feeds are provided with positive jaw feed clutches and easier engagement levers.

Power transmitting capacity is adequate to accommodate motors of ample horsepower for the latest developments in cemented carbide tooling.

We welcome the opportunity to quote production estimates on individual requirements.



Features:

- Sixteen Geared Spindle Speeds, providing a fifty to one speed range.
- Three optional spindle speed ranges with maximum up to 2000 R.P.M.
- Constant Horsepower (optional to fifteen) at all spindle speeds.
- Fast operating and effortless Electric Headstock Clutches.
- Fully Automatic Spindle Speed Changing.
- 100% anti-friction bearing headstock and aprons.
- Flanged Type Motor Mounting with reduced overhang.
- Diagonal Cross Ribbing full length of bed and underneath headstock.
- Replaceable Bed Ways of Solid Hardened and Ground Alloy Steel.
- Replaceable Hardened and Ground Steel Turret Slide Saddle Ways, Gibs, and Top Caps.
- Large Hexagon Turret and deep Turret Slide of exceptional accuracy and rigidity.
- Twelve Quick Feed Changes for Cross Slide, Carriage and Hexagon Turret.
- Single Dial Feed Selectors on both Aprons.
- Positive Tooth Feed Clutches with "Easy Action" Engagement Levers.
- Sealed Carriage and Saddle Aprons.
- "One Shot" lubrication of all Tool Slide Ways.
- Accurate and Rigid Square Turret Sealed by Protective Skirt.
- Large Hardened and Ground-in-Thread Ball Bearing Cross Slide Screw.
- Anti-Backlash Adjustable Nut on Cross Slide Screw.
- Built-in Bar Feed Stop providing extra Turret Tool Station.
- Faster Hydraulic Bar Feed and Collet Chuck.
- Only one Bar Feed Setting for a full length of Bar Stock.
- Impeller Type Coolant Pump with Integral Motor Drive.
- Optional Collet Chuck Capacities (2" or 2½" diameters).

MANUFACTURERS OF TURRET LATHES AND CUTTING-OFF LATHES

BARDONS & OLIVER, INC.

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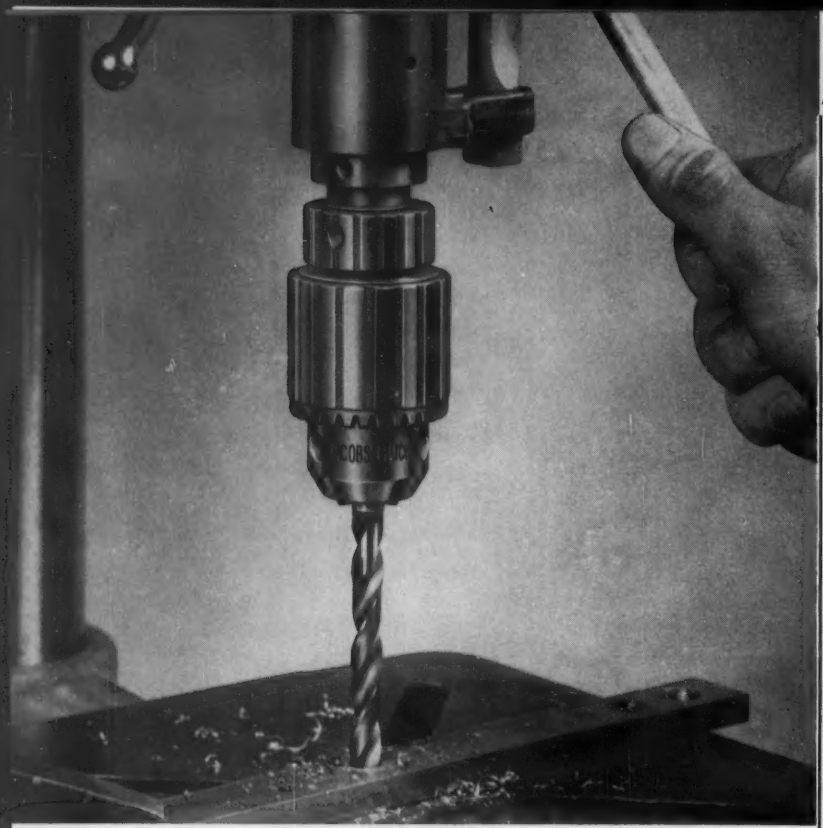
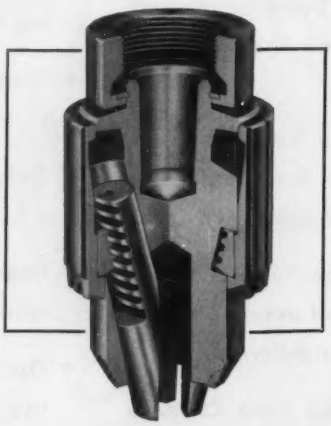


It **holds fast** *at both ends*

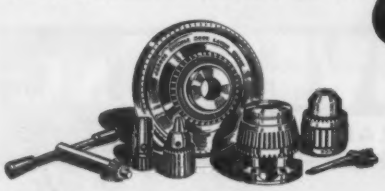
The threaded collar on this Jacobs Chuck provides a positive lock between chuck and drill press spindle. Here's a chuck that won't let go on either end, however you use it.

The locking grip on the spindle end is more than matched by a holding grip of tremendous power on the business end. And, like all Jacobs Plain Bearing Chucks, this one is capable of greater accuracy and longer precision service than any comparable chuck made today.

Jacobs Chucks for every tool and work holding need are as near as your industrial distributor. Call him for prompt, experienced service, or write The Jacobs Manufacturing Co., 1710 Jacobs Road, West Hartford, Conn. Ask for Catalog 100.



JACOBS AND YOUR LOCAL DISTRIBUTOR
are ready to deliver the chucks you need and the service you deserve.
first in chucks . . . first in service



Jacobs
CHUCKS
If it's a Jacobs–it holds

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

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Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

CHUCKING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co., (Single and Multiple Spindle) 170 E. 131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Sunstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 83, Ohio.

CHUCKS, Air Operated

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Schraders Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets

CHUCKS, Diaphragm

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

CHUCKS, Drill

Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

CHUCKS, Full Floating

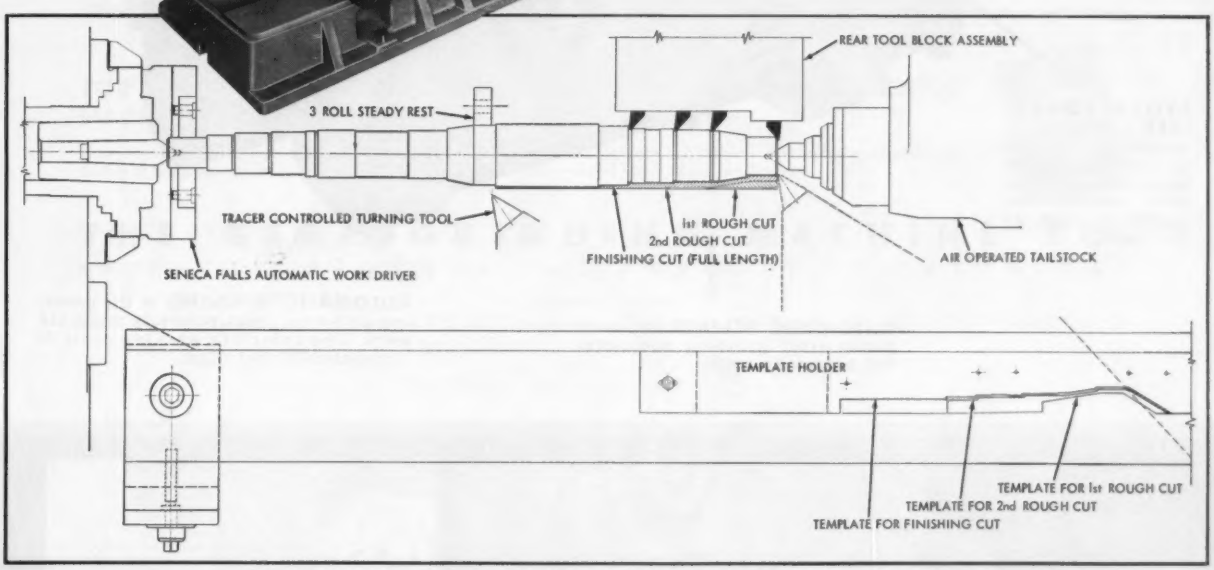
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

(*Continued on page* 314)

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

Lo-swing MODEL AP TRACER LATHE MACHINES MISCELLANEOUS SHAFTS AT LOW COST



PROBLEM: To rough and finish turn, face shoulders and undercut miscellaneous shafts automatically in medium and small sized lots.

SOLUTION: A Lo-swing Model AP Tracer Type Lathe was recommended for this job because of ease of setup and the fact that this high speed machine can be operated by semi-skilled labor. A simple type of master template reproduces size and profile of the shaft.

Rough shafts arrive at the machine centered and are hand loaded by placing one end in the Work Driver and resting the other end on the Work Cradle. The machine cycle is fully automatic and provides automatic change-over from rough to semi-finished and finished turning. The operator pushes the starting button and the tail-stock center advances, the machine starts and the tracer controlled tool rough turns, semi-finish turns and finish turns the diameters shown on the line drawing. The undercuts are made with tools mounted on the back squaring attachment. On completion of the turning operation, the carriage automatically returns to the starting position and the spindle stops.

Longitudinal feed is by rack and pinion, permitting unlimited carriage travel up to the full bed length. The Back Attachment feed cycle is synchronized with the movement of the front tracer-type carriage and requires no attention.

Let Seneca Falls engineers help solve your production turning problems.

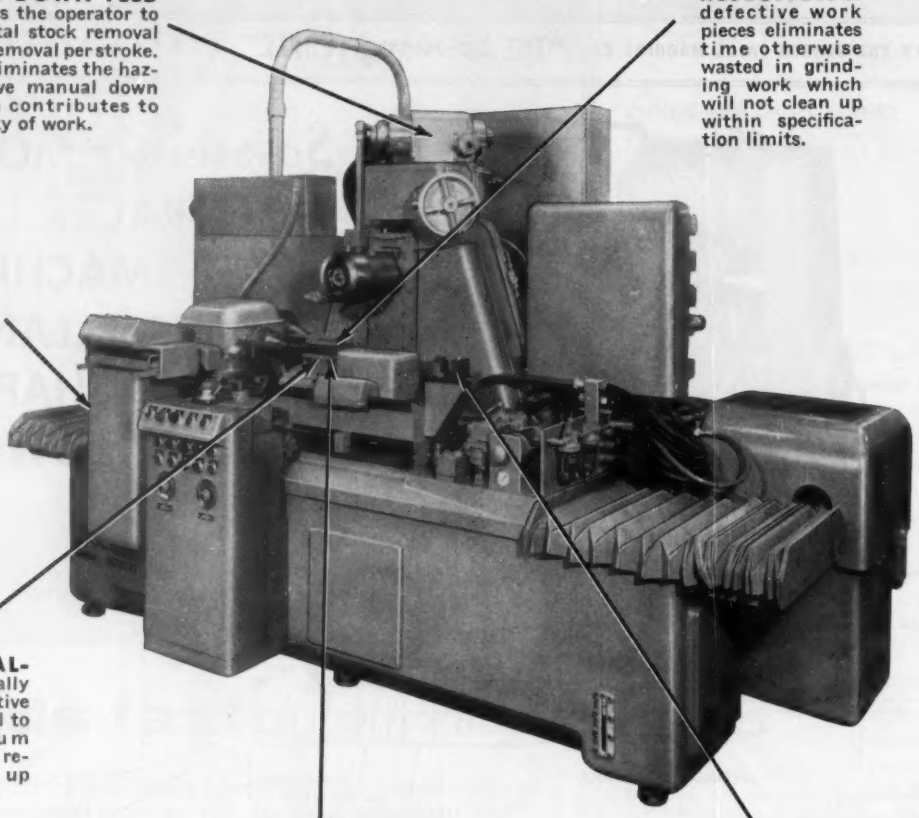
SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

AUTOMATIC DOWN FEED control permits the operator to pre-set the total stock removal and the stock removal per stroke. This feature eliminates the hazard of excessive manual down feed and also contributes to uniform quality of work.

AUTOMATIC REJECTION of defective work pieces eliminates time otherwise wasted in grinding work which will not clean up within specification limits.

AUTOMATIC LOADING of the work pieces. The machine can be hopper fed or magazine loaded, as desired.

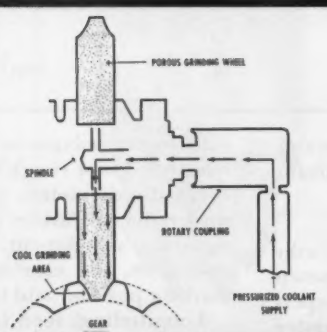


STOCK EQUALIZER automatically locates work relative to grinding wheel to assure minimum stock removal required to clean up the teeth.

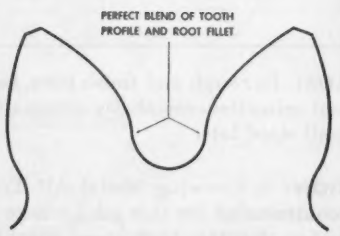
AUTOMATIC RELEASE of work pieces after grinding completes the automatic cycle.

AUTOMATIC TRIMMING of the grinding wheel assures uniformly accurate work. The complete working cycle is automatically controlled.

These 5 improved Features Insure Quality and Production



1 NON-TEMPERED, CASE-HARDENED PARTS. A controlled flow of coolant through the grinding wheel is supplied to the working area between the grinding wheel and the gear tooth. This feature, coupled with the automatic down feed, virtually eliminates the causes of surface tempering and checking during grinding. By eliminating surface tempering, the allowable surface stress of case-hardened gears can be increased tremendously without encountering pitting or scoring.



2 PERFECT BLENDING OF FILLET & PROFILE. Single or double diamond trimmers are used to assure a perfect blend between the tooth profile and the root fillet. Other methods of dressing the wheel result in irregularities at the critical section of the tooth which act as stress risers and frequently cause unnecessary tooth breakage.

INTRODUCED AT THE MACHINE TOOL SHOW...

The FIRST Fully Automatic Gear Grinding Machine in Industry

The development of fully automatic gear grinding machines has been in progress for 10 years at the Gear Grinding Machine Company. They are the product of over 45 years experience in manufacturing gear machines and gears. And here is what these new machines mean to you—the gear manufacturer.

Fine Quality Gears at High Production Rates

These new Geargrind Automatics offer the advantage of producing highly accurate, fully hardened gears at increased production rates. Whatever your gearing application—in job lots or production quantities—you'll save valuable time and decrease the need for skilled operators.

All of these advanced automatic features have been thoroughly tested in long production runs—they are ready to work for you whether your gearing needs are simple or complex. They are available on any of the complete line of gear grinding machines.

FULLY Automatic Gear Grinding Machines for • Internal and External Gears and Splines • Specially Contoured Parts

FOR MORE INFORMATION ON *Fully* Automatic GEAR GRINDING MACHINES—WRITE TODAY

Here is a new 8-page brochure on all 11 of the revolutionary advanced features available on today's Geargrind Automatics. Write or phone now—we'll send it immediately.

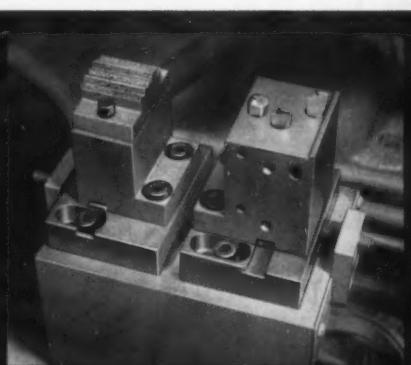
THE GEAR GRINDING MACHINE CO.

3921 CHRISTOPHER • DETROIT 11, MICHIGAN

Manufacturers of:

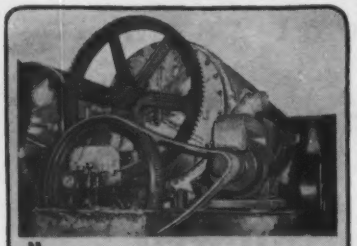
THE DETROIT SCREWMATIC 750 • RZEPPA (pronounced "Sheppa") CONSTANT VELOCITY UNIVERSAL JOINTS

3 MULTI-RIBBED GRINDING WHEEL increases the production rate by increasing the number of teeth being ground simultaneously. The number of wheels or ribs that can be used is dependent upon the work being ground. In actual tests, efficiency has been increased over 150%.



4 MULTIPLE FIXED DIAMOND TRIMMERS are used to virtually eliminate grinding wheel dressing time and increase high production. The wheels are simply fed down and then passed directly through the diamonds.

5 TIME RECORDER is provided which accumulates the total machine cycle time for production control.



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"Two years ago we switched from the lubricant we were then using to your LUBRIPLATE, and we are pleased to inform you that we have had very excellent satisfaction from its use. High speed silent chains on the drives of our fish meal cookers, which were formerly worn out in about six months, are still in service after two years."

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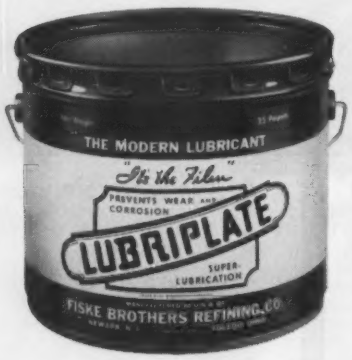
LUBRIPLATE is available in grease and fluid densities for every purpose... LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.



CHUCKS, Gear

Gleason Works, 1000 University Ave., Rochester, N. Y.

CHUCKS, Lathes, etc.

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel

Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Jarvis Corp., Middletown, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.

CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero 50, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Starrett, The L. S., Co., Athol, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

CLEANERS, Chemical, for Metal

Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.

CLUTCHES

Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

COLLARS, Safety

Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
New Britain Mch. Co., New Britain-Bridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning

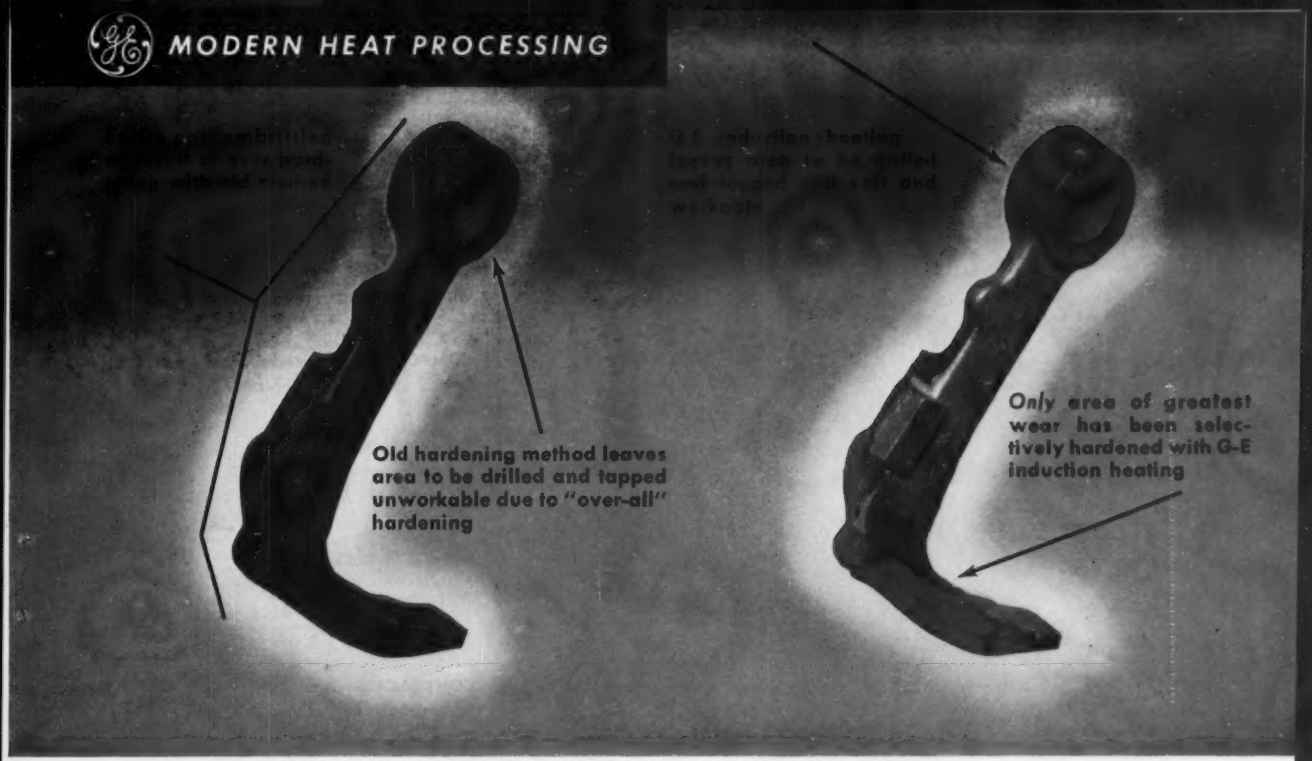
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lopping).

(*Continued on page* 316)

MODERN HEAT PROCESSING


Old hardening method leaves area to be drilled and tapped unworkable due to "over-all" hardening
Only area of greatest wear has been selectively hardened with G-E induction heating

PROBLEM:

Chill-cast rejects at Draper Corporation due to (1) Embrittlement (2) Over-all hardening

SOLUTION:

G-E Induction Heater Cuts Rejects 95% By Pinpoint Hardening Cast-iron Parts

The East Spartanburg, S. C. division of Draper Corporation was having difficulty controlling the hardening of cast-iron parts. Their old chill-cast hardening method forced them to reject many of the parts, which were overhardened and brittle. In addition, they had no way of controlling the size of the area to be hardened. This made drilling and tapping operations difficult—and frequently impossible.

SINCE INSTALLING A 20-KW G-E induction heater in their production line, they are able to cast the parts, drill and tap them while the cast iron is still soft, and then selectively harden only the area of greatest wear. This "pinpoint" hardening reduces the heated area of the parts by 70–90%. As a result, rejects have been cut 95%, costs are reduced, and the Draper Corporation is producing a product of uniform high quality.

THE COMPLETE SATISFACTION of Draper Corporation with their General Electric induction heating equipment was expressed by Mr. Fred Burgess, Plant Engineer: "Our G-E induction heater has been in operation for over five years. During that time we have greatly reduced manufacturing costs because of our decreased scrap losses and increased production. Maintenance of the heater hasn't been any problem, either. We just couldn't ask for any better service than we've had from our G-E equipment."

GENERAL ELECTRIC

WATCH FOR ANNOUNCEMENT

of General Electric's complete NEW line of electronic induction heaters

For application assistance, contact your nearest G-E Apparatus Sales Office or send coupon for free bulletin GEA-4945.

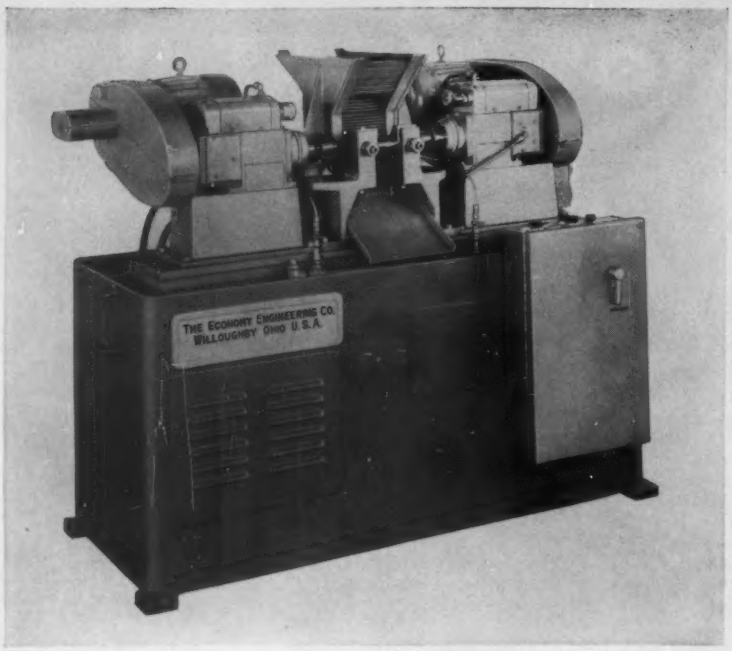
General Electric Company
Apparatus Sales Division, Section F722-2
Schenectady 5, New York

Name.....

Position.....

Company.....

City..... **State**.....



"Part per Second"

...automatically

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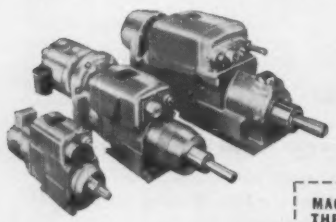
Economy Engineering Co., Willoughby, Ohio employs two Hartford Drill Units on their standard hopper fed double end machines to taper ream 60 valve push rod tubes per minute to close tolerances.

Use of Hartford Drill Units by this well known machine builder is typical of the way in which Hartford Standardized Components can bring the benefits of low cost automation to **every** manufacturer. The Economy machine can produce not only automotive push rods, but can perform practically any double end machining operation on rods and tubes . . . reaming . . . facing . . . threading . . . tapping . . . centering . . . drilling . . . chamfering . . . pointing, etc. ***Any tool requirement is available with Hartford Air-Hydraulic Drill Units. Dial them all — rate of feed — distance of rapid traverse — spindle speed — final depth.*** Take a tip from the Economy story, investigate Hartford components.

*Formerly produced under the trademark "Delta-Milwaukee" by the Rockwell Mfg. Company



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THE HARTFORD SPECIAL MACHINERY CO.
290 Homestead Avenue, Hartford 12, Conn.

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☐ Send Application Data Sheet and descriptive Bulletin.

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Company _____
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Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
White & Bagley Co., Worcester, Mass.

COMPOUNDS, Resin and Molding

General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Eisler Engrg. Co., 760 S. 13th, Newark 3, N. J.
Erie Foundry Co., Erie, Pa.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio
Fellows Gear Shaper Co., Springfield, Vt.
Hartford Special Machry. Co., 287 Homestead Ave., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Lees-Bradner Co., Cleveland, Ohio
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 250 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.

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Clark Controller Co., Cleveland, Ohio.
General Electric Co., Schenectady 5, N. Y.

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Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

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Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.

(*Continued on page* 318)

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- dual arc control for *both* voltage and current
- arc-booster starting on DC as well as AC
- operation on single phase power

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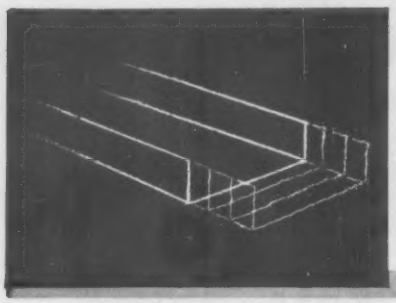
THE LINCOLN ELECTRIC COMPANY

Dept. 1207, Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment



HOLCROFT and the SHAKER HEARTH FURNACE

Volume Production of SMALL PARTS

Controlled atmospheres—heating—fuel economies—stock handling. All these are factors to consider when you are trying to determine which heat treat furnace to select.

Take stock handling, for example. You might well consider a shaker hearth furnace if you are a volume producer of small parts such as screw machine production or stampings. It's continuous—a type of stock handling that's geared to production flow—and a type that eliminates the possibility of a bottleneck in the heat treat department.

The work is either manually or automatically placed directly on a hearth which is designed to move forward quickly a few inches, stop suddenly, and then return to its original position. The sudden jolt slides the parts through the furnace. An alternate arrangement is set up so that the hearth moves forward slowly, halts, then snaps back to its original position. Either method assures uniform heat treatment of each individual part.

You can get engineering information—honest appraisals of your problem—if you consult Holcroft when you are planning expansion. The result is bound to be a heat treat facility *balanced* to your production requirements. It will cost you less in the long run! Write today for complete information!

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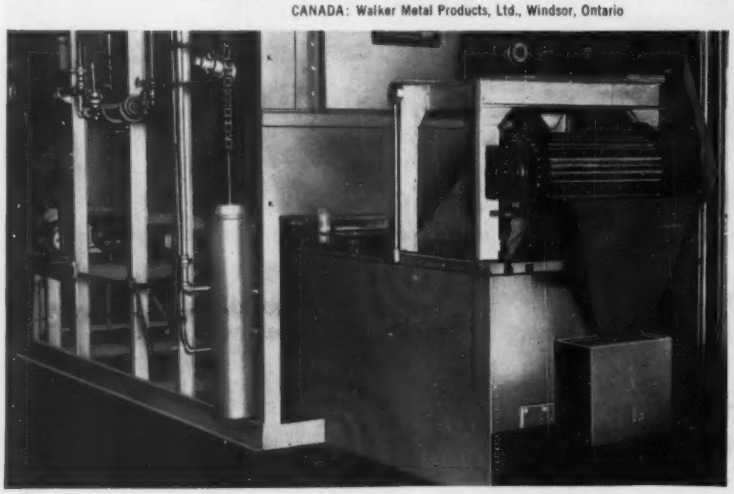
HOUSTON, TEXAS LOS ANGELES, CALIF. PHILADELPHIA, PA.
CANADA: Walker Metal Products, Ltd., Windsor, Ontario



Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Jarvis Corp., Middletown, Conn.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13 Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution

Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S., Co., Athol, Mass.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass.

COUPLINGS, Flexible

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Sier-Bath & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

(*Continued on page* 320)

Vast opportunity for machine improvement

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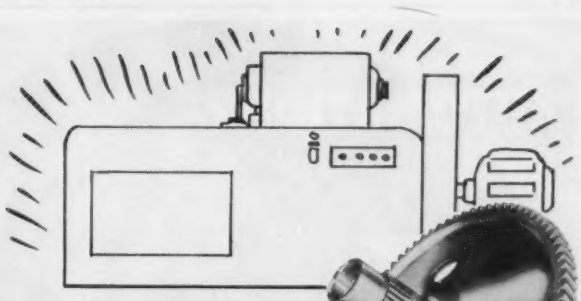
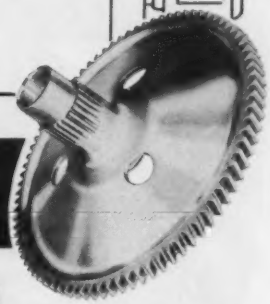
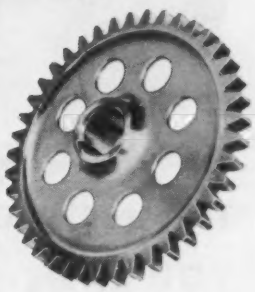


Sier-Bath PRECISION GEARS





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GEARS UNCONDITIONALLY GUARANTEED
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Straight and Coniflex Tooth Bevel Gears, 2" to 23", depending on ratio
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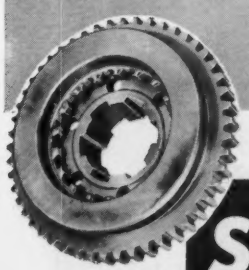
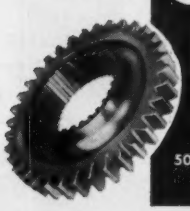
Helical Gears, to 54" diameter
Worm Gears, to 54" diameter
Worms to 12" diameter
Ground Thread Worms to 6" dia.
Herringbone Gears, to 36" dia.
Instrument Gears—1" dia. and up
Internal Gears—to 36" O.D.
Gear Grinding. Also involute and square splines, ground and unground





Sier-Bath PRECISION GEARS

Also manufacturers of Rotary Pumps and Flexible Gear Couplings

50th Anniversary — Member A.G.M.A.

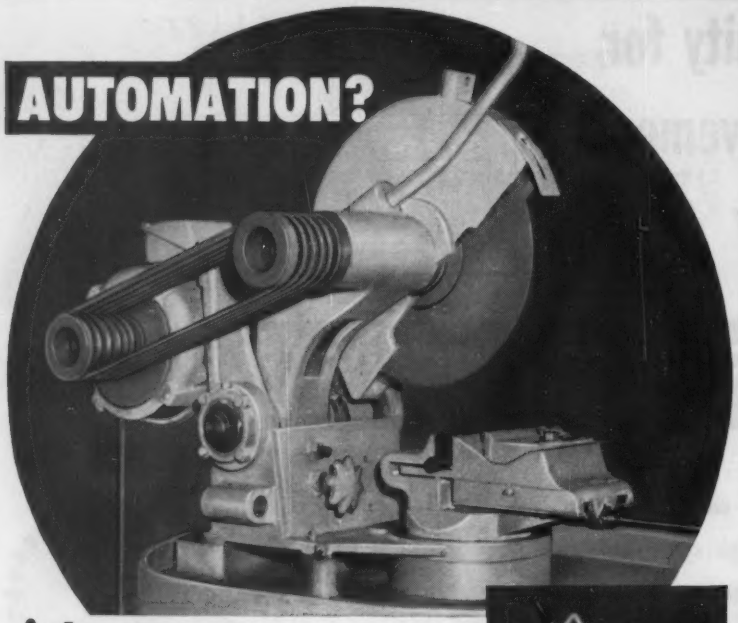
Submit prints, complete load specifications and job requirements for study and quotation

We've helped hundreds of companies—most likely we can help you to higher gear efficiency and greatly improved machine performance, both in new and existing equipment. Usual quantities, 12 or more of a kind, except for prototypes.

Sier-Bath GEAR & PUMP CO., Inc.
9248 HUDSON BOULEVARD
NORTH BERGEN, N. J.

Note to users of Precision Gears

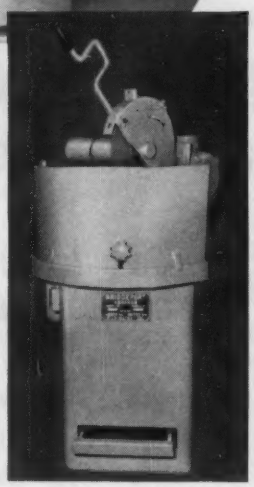
Even if you are among the few who believe your gears meet every requirement, you will find it advantageous suggestion-wise, price-wise, or both, to talk it over with the Sier-Bath gear man.



it's yours

TO ANY DEGREE WHEN YOU *specify* THIS

MODEL 48-W BRIDGEPORT ABRASIVE CUT-OFF MACHINE



Here's why . . .

- Air cylinder and hydro-check actuates head . . . saves labor and reduces wheel costs. (16" dia. wheel).
- Vise operates by air cylinder . . . integrated head, vise operation is excellent safety feature.
- Feeding mechanism which grips material to be cut, moves it into position.
- A series of micro switches tie above operations into smooth cycle which repeats automatically.
- Stainless steel spindle with Grease Sealed bearings.
- Coolant applied equally to both sides of cut.
- Vise holds *both* ends of piece being cut.
- Abundant power supplied by 7½ H.P. motor.
- Swivel head for accurate angle cutting.
- Accurate counterbalance of head by location of motor.
- Heavyweight for long life and efficient operation.
- *Complete automation* produces close tolerances, increases production, saves labor.

LOBDELL has a *complete line* of BRIDGEPORT Cut-Off Machines to suit every need. *Write for further details.*

LOBDELL DIVISION
UNITED ENGINEERING AND FOUNDRY COMPANY
WILMINGTON 99, DELAWARE

CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).
National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
du Mont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich. (Thread).
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CUTTERS, Rotary

See Files & Burrs Rotary

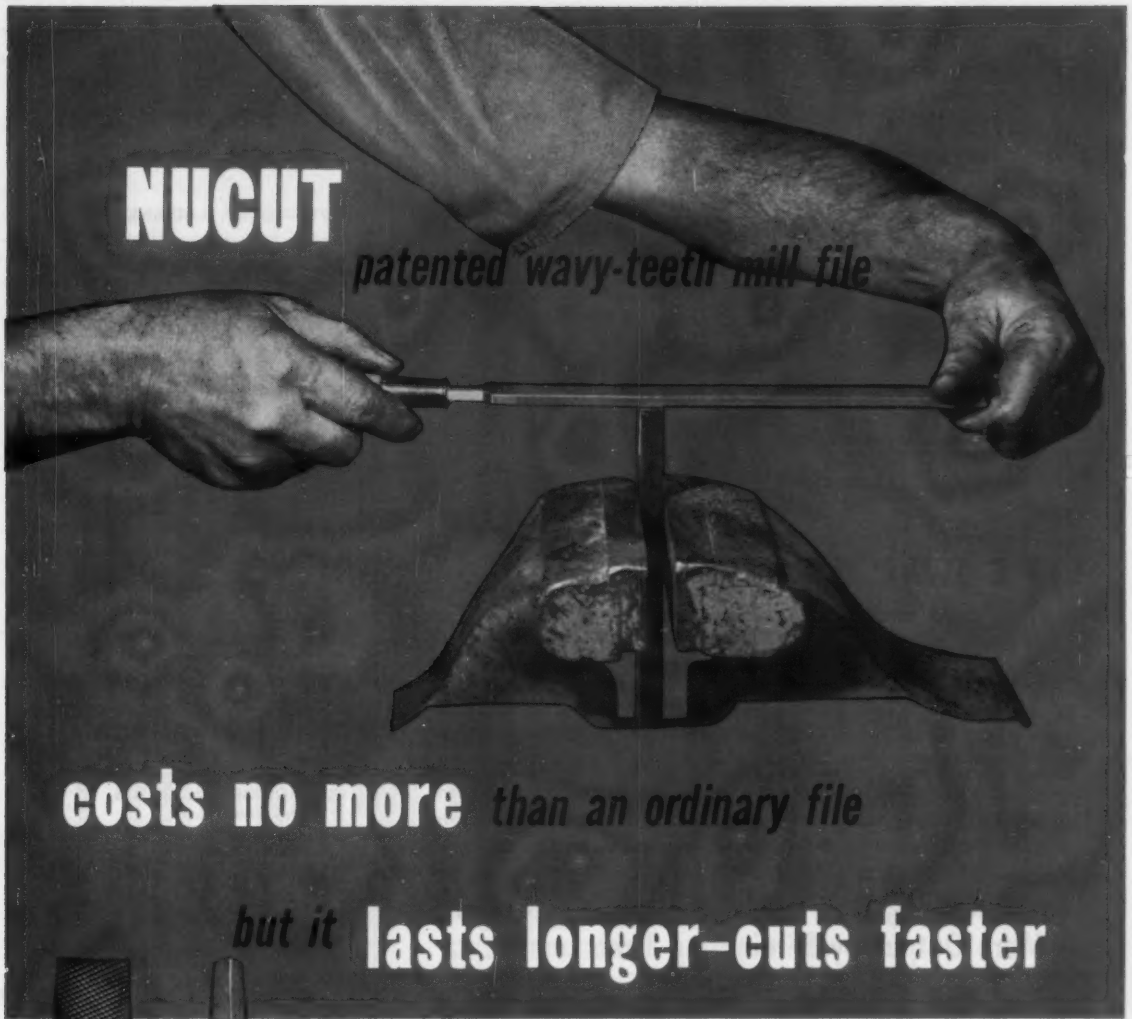
CUTTING COMPOUNDS

See Compounds, Cutting, grinding, Etc.

CUTTING AND GRINDING FLUIDS

Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cimcool Div., Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

(*Continued on page 322*)



costs no more *than an ordinary file*

but it lasts longer–cuts faster

Heller NUCUT files combine coarse, fine and extra fine teeth in a planned irregularity, creating the "wavy-teeth" design. The coarse teeth cut deep, clean; the fine teeth leave a smooth, scratch-free finish. This "Wavy-Teeth" design makes the file clear itself, adds longer life. NUCUT "wavy-teeth" files cut faster without scraping or chattering. Ask your distributor for Heller NUCUT files with patented "wavy-teeth."

HELLER TOOL CO.

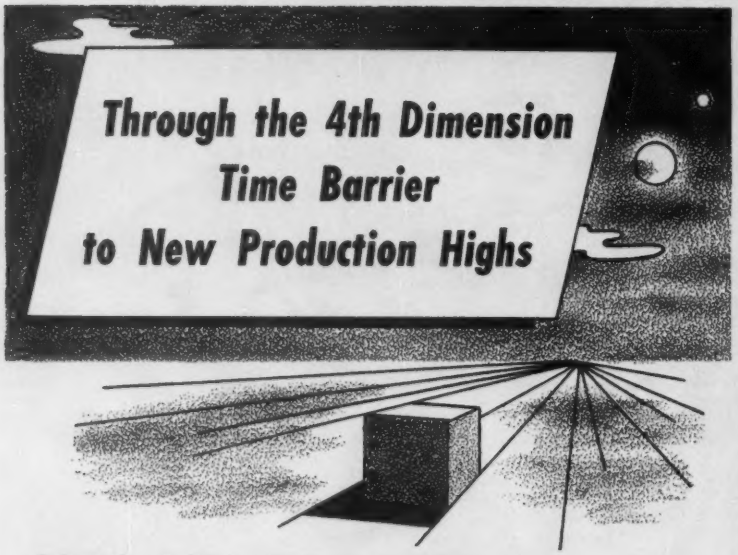
A Subsidiary of Simonds Saw and Steel Company

NEWCOMERSTOWN, OHIO

HELLER TOOL CO. SINCE 1836

BRANCH OFFICES: New York, Chicago, Detroit, Los Angeles

YOUR HELLER DISTRIBUTOR CAN SUPPLY ALL YOUR FILE NEEDS



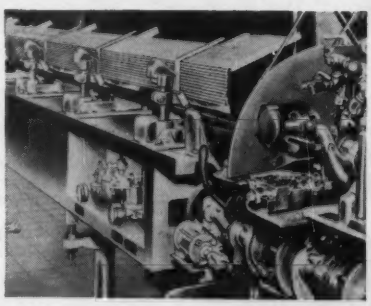
LIPE AML BAR FEED

gears machine production to the steady flow of Time

ALL industrial results are achieved in Time . . . *vital 4th dimension that measures output, costs, profit.* Shorten the time gap between operations . . . shorten the time when machines are "cutting air" . . . keep machines producing at a steady optimum rate during the fatigue slow-down from 10:30 to noon, and from 3 P.M., till closing time . . . *and you are getting 4th Dimension production.* Production that is geared to the steady flow of Time.

Lipe AML Bar Feed Produces from 30% to 100% More Output by Eliminating Time Losses . . .

Time losses account for the enormous differences in output among workmen. By eliminating these losses automatically, the Lipe AML Bar Feed boosts overall production from 30% to 100%. That's because stock is fed to the machine independent of the operator. Constant pressure behind the stock assures uniform speed of feed. No feed fingers to fail or mar stock. No multiple feed-outs, even on the longest pieces.



Mail the coupon now for free literature giving full details on the Lipe AML Bar Feed.

LIPE ROLLWAY CORPORATION
Syracuse 4, N. Y.

Sure, I'd like to know more about the Lipe AML Bar Feed. Send me your free booklet.

Name_____ Title_____

Company_____

Street_____

P.O._____ Zone_____ State_____

Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Johnson Mfg. Co., Albion, Mich.
Landis Machine Co., Waynesboro, Pa., (Pipe).
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

CUTTING-OFF MACHINES, Abrasive Wheel

Campbell Machine Div., American Chain & Cable, Bridgeport, Conn.
Hamilton Div., The Lodge & Shipley Co., Hamilton 1, Ohio.
Wallace Tube Co., 1304-08 Diversey Pkwy., Chicago, Ill.
Master Chemical Corp., 13 Huron St., Toledo 1, Ohio.

CUTTING-OFF MACHINES, Cold Saw

See Sewing Machines, Circular

CUTTING-OFF MACHINES, Metal Band Saws

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Grob, Inc., Grafton, Wis.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo

CUTTING-OFF WHEELS, Abrasive

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

Baker Bros., Inc., Sta. F, Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

(*Continued on page* 324)

THE FINAL RETURN YOU GET ON ANY MACHINE YOU BOUGHT AT THE SHOW WILL BE DETERMINED BY A LITTLE TOOL LIKE THIS

You looked at many machines at the Machine Tool Builders Show. They were the most modern that man's ingenuity has been able to design and build . . . with higher powers, feeds, speeds . . . greater versatility. Perhaps you bought one . . . or more than one. Or perhaps you deferred your purchase to a later date. But, in either case, remember this: the *final* return on any machine depends on a little tool.

It will pay you to give your machines the tools they deserve . . . the BEST — whether the machine is one of the latest, high velocity automation types or an older one now in your plant.

For the latest developments in tool design and cutting grades . . . tooling for *consistent top* performance on any type of operation, or on any machine . . . look to Kennametal* for the best; because Kennametal has led the industry for years in improving tools and tooling techniques.

So, to be assured of the best . . . tooling to give the most consistent *repeat* performance, lowest cost per cutting edge and tools proved BEST — TEST AFTER TEST, specify Kennametal by *grade* and by *toolholder*.

Let a Kennametal Tool Engineer show you reports of performances with Kennametal tooling. He will be glad to help you select the right grade and tool for each operation. KENNAMETAL INC., Latrobe, Pa.

*Registered Trademark

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The NEW KENDEX

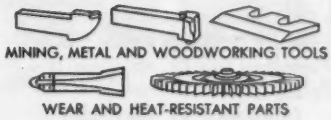
(illustrated above)

. . . combines simple but sturdy construction and the capacity to take deep cuts over a wide range of operations with inexpensive, turn-over type "throwaway" inserts. The clamp lifts for quick, accurate indexing, and is so designed that clamp forces are in the same direction as the cutting forces. Chipbreaker and shim of Kennametal, for long life, reduced machining costs. *Available immediately from stock in 17 styles and sizes.*

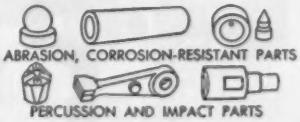
The NEW Kennametal Grade K-21

is outperforming all other carbides in the General Purpose Steel-cutting group because of its high edge strength combined with superior wear qualities and resistance to cratering. *Available in all insert styles from stock.*

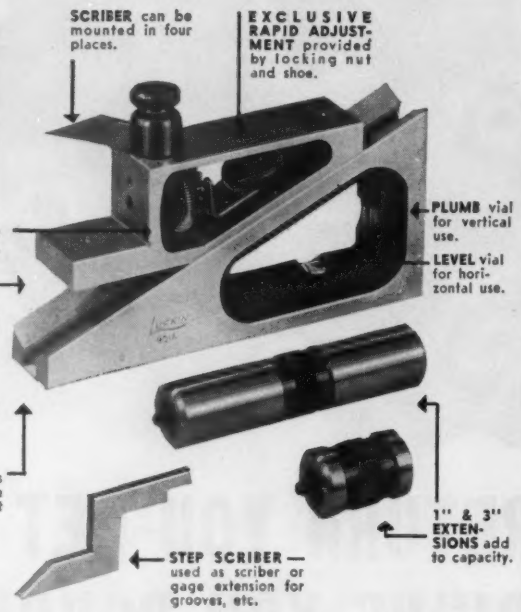
Give your machines the tools they deserve . . . the BEST

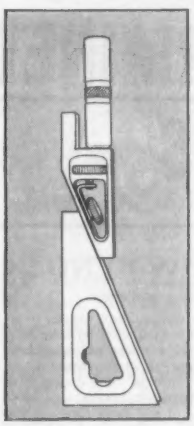


INDUSTRY AND **KENNAMETAL** *...Partners in Progress*



NEW LUFKIN 1" WIDE MASTER PLANER GAGES


SCRIBER can be mounted in four places.
EXCLUSIVE RAPID ADJUSTMENT provided by locking nut and shoe.
PLUMB vial for vertical use.
LEVEL vial for horizontal use.
FINE ADJUSTMENT screw for exact positioning.
FULL 1" SQUARE STEP takes standard gage blocks.
MACHINED V WAYS eliminate side play.
1" WIDE BASE gives added stability. Slide undersize to permit easy positioning when gage is on side.
1" & 3" EXTENSIONS add to capacity.
STEP SCRIBER — used as scriber or gage extension for grooves, etc.

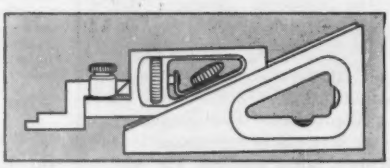


New Design Provides More Stability, Faster Operation

The all-new design of the Lufkin 901A Master Planer Gage is loaded with features you'll like. Note the more stable 1" wide base, the fine adjustment screw, the exclusive rapid adjustment lock, the exclusive plumb level and the many other features shown above. Ask your Industrial Distributor to bring one around so you can try it for yourself. It's available as pictured above, or in other models without certain accessories or features.

with 3" extension in use to extend capacity.

with offset attachment . . . used for setting in narrow places or reversed and used as a scriber.



BUY LUFKIN TAPES • RULES • PRECISION TOOLS FROM YOUR DISTRIBUTOR

THE LUFKIN RULE CO., SAGINAW, MICH.

SAVE UNCERTAINTY . . .

Consult Your Industrial Distributor

• He has the answers to "Where can I get it?" at his fingertips — often from stock for immediate delivery.

• His experience gives him a sure answer to your question, "Is this the best solution to my particular problem?"

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CYLINDERS, Air

Hannifin Corp., 501 Wolf Rd., Des Plaines, Ill.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

CYLINDERS, Hydraulic

Barnes, John S., Corp., Rockford, Ill.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg., Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co. Inc., 810 Center Ave., Logansport, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

CYLINDERS, Pneumatic

Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.

DEALERS, Machinery

Falk Machinery Co., 18 Ward St., Rochester, N. Y.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

DEMAGNETIZERS

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Heald Mch. Co., 10 New Bond St., Worcester 6, Mass.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Taft-Pierce Mfg. Co., Woonsocket, R. I.
Walker, O. S. Inc., Worcester, Mass.

DESIGNERS, Machine and Tool

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Hartford Specialty Mchry. Co., 287 Homestead St., Hartford, Conn.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIAMONDS AND DIAMOND TOOLS

Christensen Diamond Prod., 1937 S. Second West, Salt Lake City, Utah
Precision Diamond Tool Co., 102 South Grove Ave., Elgin, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

DIE-CASTING

See Castings, Die

DIE-CASTING MACHINES

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Lake Erie Engineering Corp., Kenmore Station Buffalo, N. Y.

(*Continued on page* 326)

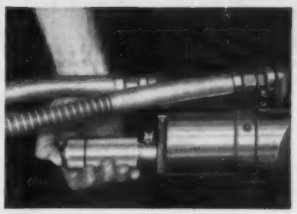
ACTION PICTURE
of how to save money by riveting!

This action photo, taken on the frame assembly line in one of the largest auto factories, illustrates how cost-conscious manufacturers save money with Hannifin "Hy-Power" Hydraulic Riveters.

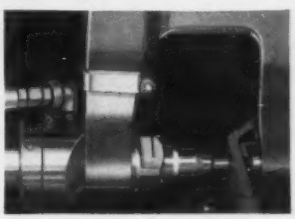
First step in assembly is to rivet the frame together... with Hannifin "Hy-Power" Riveters. The light-weight forged C-Frames hang from balancers within easy reach of each operator. No special skill is required to head the ⅜" rivets, cold, each in seconds. What's more, this "silent squeeze" method forms stronger, more uniform rivets, hot or cold.

Power source is the Hannifin "Hy-Power" Hydraulic Pressure Generator which quietly supplies pressure to the "Hy-Power" Cylinder that does the work. These riveters are available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities.

here's the HANNIFIN "HY-POWER" WORK CYCLE



In position. A single control button starts (or interrupts) the automatic Hy-Power cycle.



Ram approaches fast, then hydraulic pressure automatically intensifies, and the rivet head is formed.

Fast, automatic return. Total elapsed time to head a rivet is only 2 to 3 seconds.

"HY-POWER" CAN ALSO BE USED IN MULTIPLE TO SET SEVERAL RIVETS

Bulletin 150 tells how to save money on riveting, staking, punching, forming and bending operations. Write for copy.

do ALL you can do... with

HANNIFIN

Hannifin Corporation, 509 South Wolf Road, Des Plaines, Ill.

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

COSTS Go DOWN
UP Go es PRODUCTION
with
OLIVER ACE
Universal Tool and Cutter Grinders

Simple to set up, easy to operate, the OLIVER ACE handles a wider range of cutters than do ordinary cutter grinders, yet requires no computation. With the ACE, time lags are cut to the bone . . . the simplicity of design and operation make economy of motion and fast grinding certain. The time-proved, soundly engineered Oliver ACE effects economies in floor space and less outlay in dollars for this truly superior type machine.

Direct Reading for Clearance
—Reduces Fatigue
—Eases Operators' Jobs

Especially qualified for grinding tungsten-carbide and high speed milling cutters and tools, the Oliver ACE has only one sliding part with ample bearing, efficiently protected from dust. Only two simple fixtures are required for a general range of cutters. Quick, accurate and easy . . . the ACE is maintaining its long-standing reputation in thousands of plants for doing the job for which it is built.

Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing and carbide tipped circular saws.
2 MODELS: Standard and Heavy Duty (illustrated)
Write Today for Complete Data
See our catalog in Sweet's Directory

OLIVER INSTRUMENT CO.
1410 E. MAUMEE • ADRIAN, MICHIGAN

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

DIE CUSHIONS

Bliss, E. W. Co., 1375 Raff Rd., S. W. Conton, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennamental Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DIEMAKERS' SUPPLIES

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DIEMAKING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Cincinnati Milling Mach. Co., Oakley, Cincinnati 9, Ohio.
Grob, Inc., Grafton, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
Oliver Instrument Co., 1410 E. Moumee St., Adrian, Mich.

DIE SETS, Standard

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 225 N. 18th St., Ampere, N. J.
Wales-Strippet Corp., North Tonawanda, N. Y.

DIE-SINKING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Groton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Pratt & Whitney, West Hartford 1, Conn.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIE-SINKING PRESSES

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

DIE STOCKS

See Stocks, Die

DIES, Sheet Metal, Etc.

Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio.
Carboloy Dept. General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mach Co., 955 Cleveland Ave., Columbus, Ohio.
Dreis & Krupp Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Mch. Co., Bridgeton, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Niagara Mch. & Tool Wks., 683 Northland Ave., Buffalo, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Winzeler Mfg. & Tool Co., 1712 W. Arcade Pl., Chicago 12, Ill.

(*Continued on page* 328)

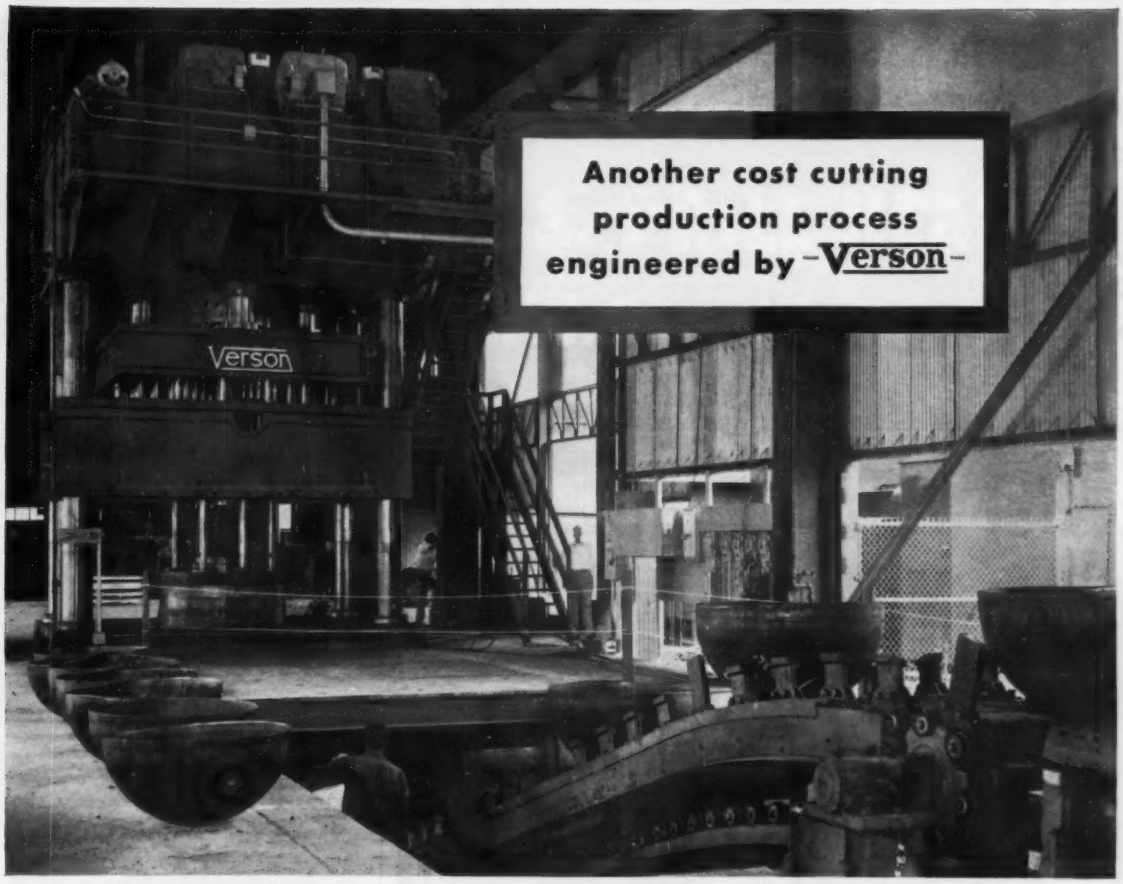


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Plate is fed to the press automatically. The head, regardless of size, is formed in a single press stroke. The completed head is pushed through a bed opening to a pneumatically operated elevator. The work is then transferred from the elevator to a conveyor and discharged. Tooling is supported in a manner that not only permits forming the wide range of sizes, but allows each size to be pushed through the bed opening.

Here is a good example of Verson's basic philosophy—*Anyone can build a press, Verson builds production processes.* If you have a problem involving the press forming of metals, this philosophy will pay you dividends. For recommendations, send an outline of your requirements.

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For more information on products advertised, use Inquiry Card, page 243

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg., Mansfield, Mass.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Threadwell Tap & Die Co., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co., Westville Station, New Haven 45, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

DIES, Thread Rolling

Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

DISCS, Abrasives

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See Indexing and Spacing Equipment

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Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRESSERS, Grinding Wheel

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Metal Carbides Corp., Youngstown, Ohio.
Meyers, W. F. Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Sherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.

DRIFTS, DRILL

Armstrong, Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth, Rd., Plymouth, Mich.

DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buffalo Forge Co., Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Etto Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Jarvis Corp., Middletown, Conn.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 Lafayette, Detroit 7, Mich.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., Inc., 946-H Harriet St., Cincinnati 3, Ohio.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

(*Continued on page* 330)

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Cleveland Twist Drill Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLING MACHINES, Automatic

Avey Drilling Mch., Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Wales-Strippet Corp., North Tonawanda, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Mch. Co., 126 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
Edlund Machinery Co., Cortland, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

DRILLING MACHINES, Boiler

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland.

DRILLING MACHINES, Deep Hole

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S 7th and N. St., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Wales-Strippet Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Gang

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N.Y.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

DRILLING MACHINES, Horiz.

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H

(*Continued on page 332*)

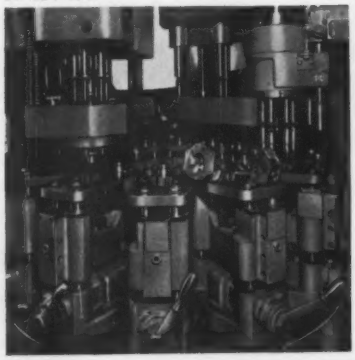
MILLHOLLAND

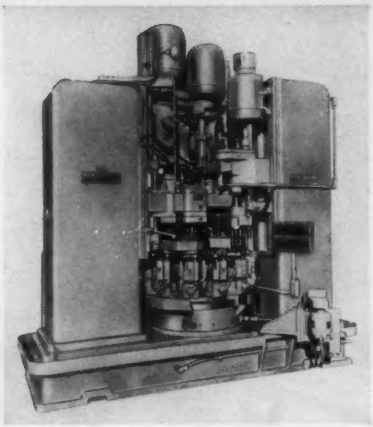
12-Station Vertical Indexing Machine

34 Spindles!

93 Pieces per Hour!

Here is Millholland versatility in action!





Lead Screw Tapper with reversing motor drives a 6-spindle tapping head. All machine elements are electrically synchronized, with push-button control for "cycle start," automatic single cycle, set-up and emergency stop. Chip disposal is simplified with wiper blades rotating within a ring on the index table to bring chips to a removable pan.

Unique Holding Fixture

With a 31-second cycle time, this machine produces 93 pieces per hour at 80% efficiency! This chip cutting efficiency is made possible by the distinctive design of the plate type cam used in Millholland Automatic Units, plus the action of the pneumatic counterbalance.

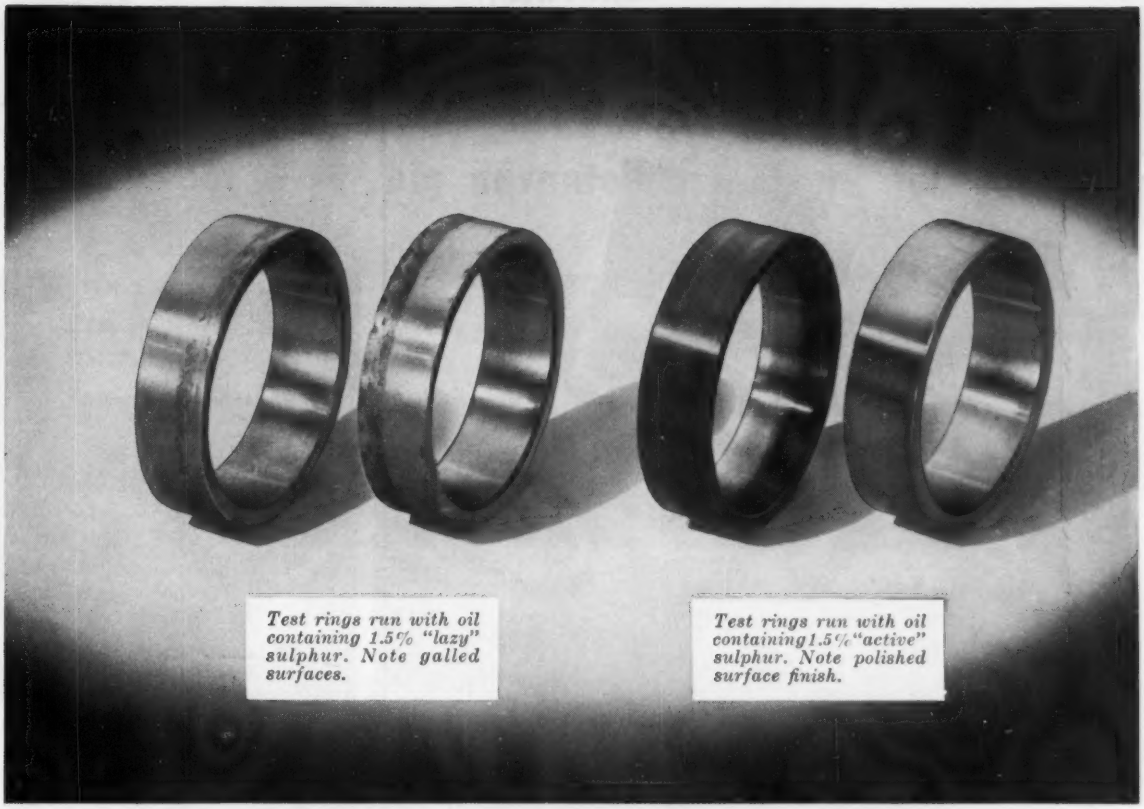
Two No. 5 Units are mounted vertically, the first with 22 spindles, the second with 5; a No. 2 unit is mounted horizontally on a rapid travel slide, and an Automatic

Part requirements dictated location using self-centering horizontal vees with up-acting clamps, actuated by a single handle operating through a small arc. Fixtures also contain register pins for all bushing plates. The 12 fixtures are mounted on an independently powered automatic index table with self-contained lubrication pump.

A complex production problem, solved efficiently with Millholland equipment and Millholland know-how.

Write for Bulletin M-9 giving further details.

W. K. MILLHOLLAND MACHINERY CO.
6402 Westfield Blvd. Indianapolis 20, Indiana



Test rings run with oil containing 1.5% "lazy" sulphur. Note galled surfaces.

Test rings run with oil containing 1.5% "active" sulphur. Note polished surface finish.

Only ACTIVE Sulphur Provides Fluid Lubrication Under Extreme Pressures

This comparative test proves it! Both tests were run on an SAE Lubricant Tester using two oils with the same percentage of sulphur. The specifications were similar—but look at the results!

The set of rings on the left were run with an oil containing "lazy" sulphur that did not provide the necessary anti-weld qualities. Under the heavy loads present in the test, the rings quickly galled and seized. The pair on the right were run with an oil containing "active" sulphur, the *only* type of sulphur that will prevent galling or seizure. It is performance that counts, not specifications.

"Active" sulphur in a cutting oil, readily reacts with the metal surfaces of the tool, chip and workpiece to produce metallic sulphide films that become fluid lubricants when sufficient heat is generated, and provide lubrication under the high temperatures that exist in the cutting orbit.

Stuart Oil Company's Shop Note Book, Bulletin S-2, contains further information on how to select a sulphurized cutting oil. Write for your copy today, and ask to have "the Man in the Barrel", your Stuart Representative, call too. He will help you select the cutting fluid that will provide the very best results under the conditions you will subject it to.

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National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch Tool Co., 2531 11th St., Rockford, Ill.

DRILLING MACHINES, Horizontal Portable

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.

DRILLING MACHINES, Inverted

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

DRILLING MACHINES, Multiple Center Column Type

Avey Drilling Mch., Co., 26 E. Third St., Covington, Ky.
Barnes Drill Co., 814 Chestnut, Rockford Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Spindle

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio
Cleereman Mch. Tool Co., Green Bay, Wis.
Cleveland Tapping Machine Co., 1201 Camden Ave., S. W., Canton 6, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia Ave., Rockford, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

(*Continued on page* 336)

Zagar Gearless Drill Heads

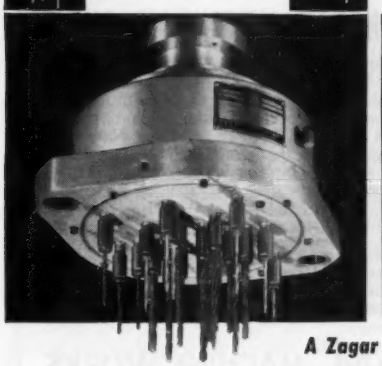
put 4 big advantages to work for you

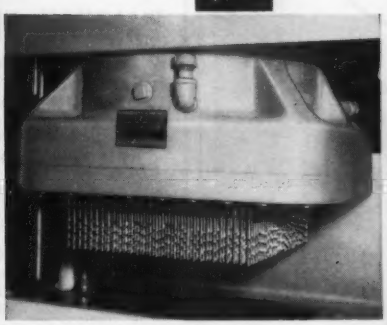
Any number of holes

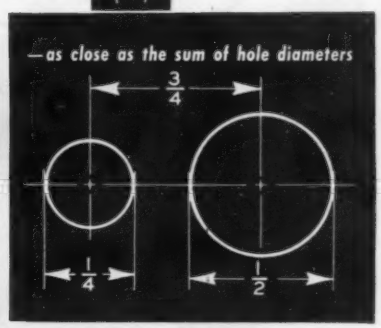
Any hole pattern

Any material

On all centers







A Zagar drill head is never obsolete. Zagar can re-locate spindles for other hole patterns.

Can you visualize the savings made possible by drilling up to 1000 holes at one pass? Zagar standard practice can handle any machinable material up to 1½" diameter. Holes of varying diameters can be drilled to form any pattern. Zagar Gearless Drill Heads, their efficiency proven by many years' success, can be installed on existing drill presses. Or, Zagar will lay out the necessary tooling for your entire job. May we see your sample parts and study your requirements? There is only one *right* answer—one *best* answer—for those requirements. May we supply it?

Let **ZAGAR** tooling plan the complete job for you

Whether your runs are long or short, let Zagar engineering survey your needs with a view to saving you the cost of special machines. In the case at the right two lines of *standardized* self-clamping drill jigs ream, tap and drill an aluminum die casting, both valve body and cover. The problem of limited production was readily solved. What, sir, are your requirements?

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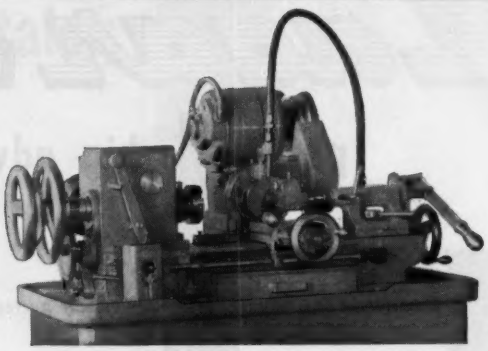

WALTHAM THREAD MILLING MACHINE

For profitable small part thread milling—use the Waltham Thread Miller. We have recently made a number of changes in the design of these machines that add to their operating efficiency and improve their appearance. New pedestal design eliminates need for having access to rear side, permitting machines to be placed back-to-back or against a wall. Spindle speeds are regulated from 0.5 to 5.75 rpm by easily accessible but covered pick-off gears.

These and other important changes are all described in supplementary bulletin M, which illustrates the whole machine. Send for your copy.

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90

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Holes, Contours, Surfaces

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Company, Inc. 734 Union Avenue, Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Die Flippers, Motorized Centers and a complete line of Hole Location Accessories.

ACHIEVING PERMANENCE OF ACCURACY

Just as important as the initial accuracy of a precision machine tool is the *life expectancy* of this accuracy. And the most effective way to insure long-lasting accuracy is to give *dimensional stability* and *wear resistance* special consideration during machine design.

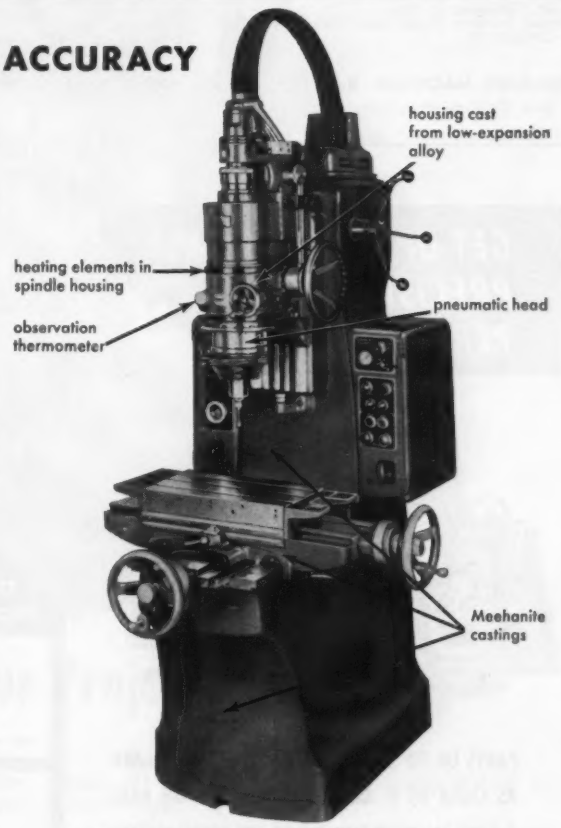
The following causes of dimensional *in*stability are most frequently encountered: thermal expansion, unstable constituents in the material; and stresses in the material. In the design of the No. 2 Moore Jig Grinder, all of these factors were taken into account and special features were incorporated to counteract them.

All the inherent accuracy of a measuring system, capable of positioning the workpiece in relation to the spindle within a tenth, is rendered nearly valueless if the spindle does not retain its position during machining operations. Such movement, caused by thermal expansion, is inevitable unless steps are taken during design to minimize or prevent it.

Electric heating elements were incorporated in the main spindle housing of the Moore Jig Grinder to maintain uniform temperature—whether machine is running or not. An observation thermometer is located so as to indicate any abnormal temperature change within the housing. The housing itself is cast from 36% nickel iron to further minimize effects of temperature variations. And a pneumatic head directs air onto the workpiece, preventing undue temperature rise both in the workpiece and in the locating members of the machine.

Instability resulting from gradual relaxation of locked-in stresses in castings is prevented by suitable stress-relieving cycles during the manufacture of Moore machine components. Similarly, the best way to avoid unstable hardened steel parts is by tempering them. Moore follows this practice.

Further wear resistance was built into the Moore Jig Grinder by means of: adequate way and bearing surface, scientifically proportioned to minimize and distribute wear; all reciprocating parts of nitrided steel—almost as wear-resistant as carbide; pressure lubrication of ways; lead screws and nuts made from nitrided steel and aluminum bronze, respectively, combining to offer low coefficient of friction, abrasion resistance and hardness; and dust protection devices.



Special design features of the No. 2 Moore Jig Grinder insure permanence of accuracy.

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in toolmaking and production – possible only with *engineered methods and equipment*, described fully in HOLES, CONTOURS AND SURFACES. 424 pages, 495 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Price only $5 in U.S.A., $6 elsewhere. Send check or money order to Moore Special Tool Co., Inc., 734 Union Ave., Bridgeport 7, Connecticut.

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See Drilling Machines, Gang

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(*Continued on page* 338)

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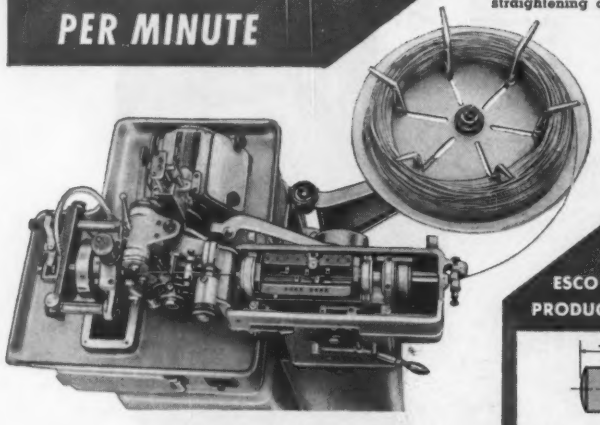
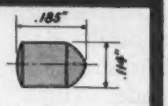
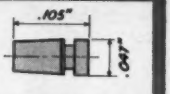
Below: ESCO ROTOMATIC DS-7 with optional wire-straightening attachment



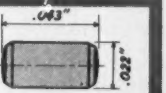
TYPICAL ESCO ROTOMATIC PRODUCTION RATES



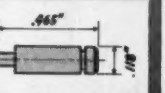
100/min.—brass



63/min.—nickel-silver



50/min.—nickel



10/min.—mild steel

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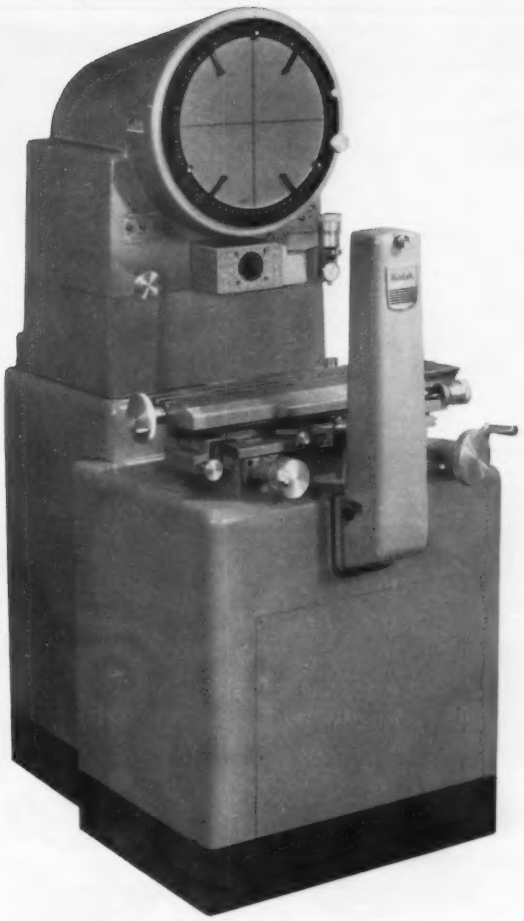

Here's how Kodak combines added work capacity with 14-inch screen economy in the new Kodak Contour Projector Model 14-5

If you make heavy, bulky parts to close tolerances, the new Kodak Contour Projector, Model 14-5, has a place in your inspection program.

For the 14-5 combines the heavy-duty work table and 8″ travel of the Model 30 with the economy of a 14-inch screen.

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For complete information on the Model 14-5, write for the new 12-page booklet "Projection Gaging with Kodak Contour Projectors." It tells how this new precision projector can help you check parts and components to accuracies of the order of .0001″—quickly and economically.

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Special Products Sales Division, Rochester 4, N. Y.

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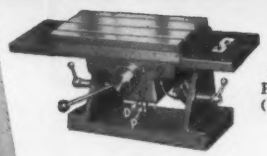
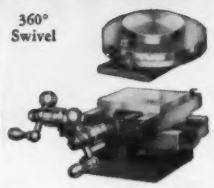
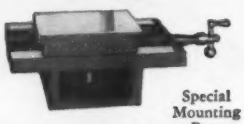


8"x21" Precision (Tilting) Table

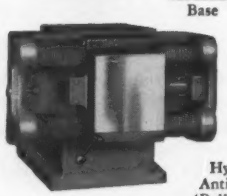
360° Swivel



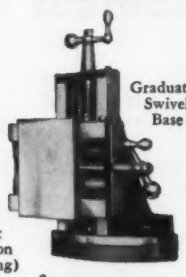
Compound Feed



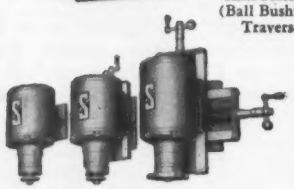
Special Mounting Base



Graduated Swivel Base



Hydraulic Anti-Friction (Ball Bushing) Traverse



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Talking About Die Sets

WITH

PHIL MARSILIUS

Vice-President
The Producto Machine Co.

Die Springs: Production Bonus or Bottleneck?—It all depends on how you, the user, select them and use them. Die springs fall into three general classifications according to type of wire used – square, oval and round. The type used in a die is determined in the original design and substitution is not easy once the die has been built, since inside and outside diameters, deflection and pressures vary widely among the three types. Great care, therefore, must be taken in the selection to see that the spring will withstand operating conditions. Should the original choice prove incorrect, re-machining of the die to accommodate a different spring type will prove expensive, to say nothing of the costly downtime involved.

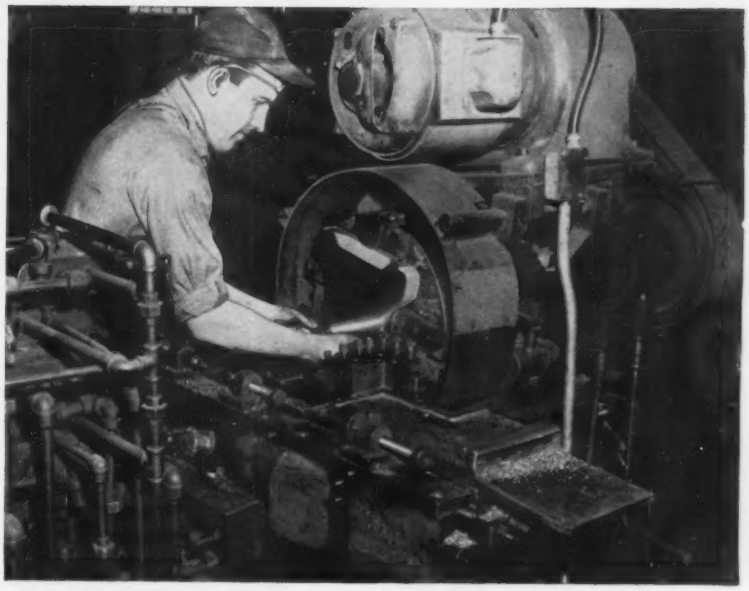
Types of Springs—Square wire springs are usually made from high carbon steel and used where a maximum load rate and a normal travel are required. They are best suited to *short* production runs since the forming operation for them and the square cross-section are more apt to result in failure when used for any great length of time.

Oval wire springs are available in three load ratings—30%, 37% and 50% deflection—and in two types of steel, high carbon and electric furnace chrome-vanadium. They are increasing in popularity because their design tends to eliminate failures resulting from structural strains and weak points. Carbon springs of this type are suitable for most applications and can be run for considerable time before failure. Chrome-vanadium springs, while slightly higher-priced, more or less guarantee performance for at least three times longer than carbon steel springs. When extreme economy is not a factor, best performance and reduced downtime are practically insured by use of chrome-vanadium.

Round wire springs are not generally suitable for die applications because of the difficulty of obtaining proper travel and load ratings for the standard sizes.

Hints on Proper Use—Even the best spring can fail if improperly used. Here are a few hints: 1. Springs should be sufficiently supported in a hole or over a rod or stripper bolt to guide the spring adequately under stress. Lack of support can result in crushing, twisting, binding or surface wear on even the best springs; 2. When altering spring lengths by cutting and grinding, care should be taken to prevent excess heat generation which causes spring to lose its temper; 3. For springs set in holes, squaring the bottom of the hole to give a flat seat is an added safeguard toward longer life; 4. Do not deflect springs beyond the recommended limits for the speed of operation.

To prevent die breakage and reduce downtime, your best protection is proper spring selection.



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Putting precision into a Producto die set begins on semi-steel sets with the turning of the shank and top and bottom surfaces on Producto-built lathes like the one above. These high-speed production lathes are *100% automatic* in function. A gang of cutting tools, preset for each die set size, automatically turns the shank to diameter and length and faces off the top of each punch holder. Next, a companion lathe a few feet away faces the bottom.

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National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

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Consolidated Mch. Tool Corp., Rochester, N. Y.
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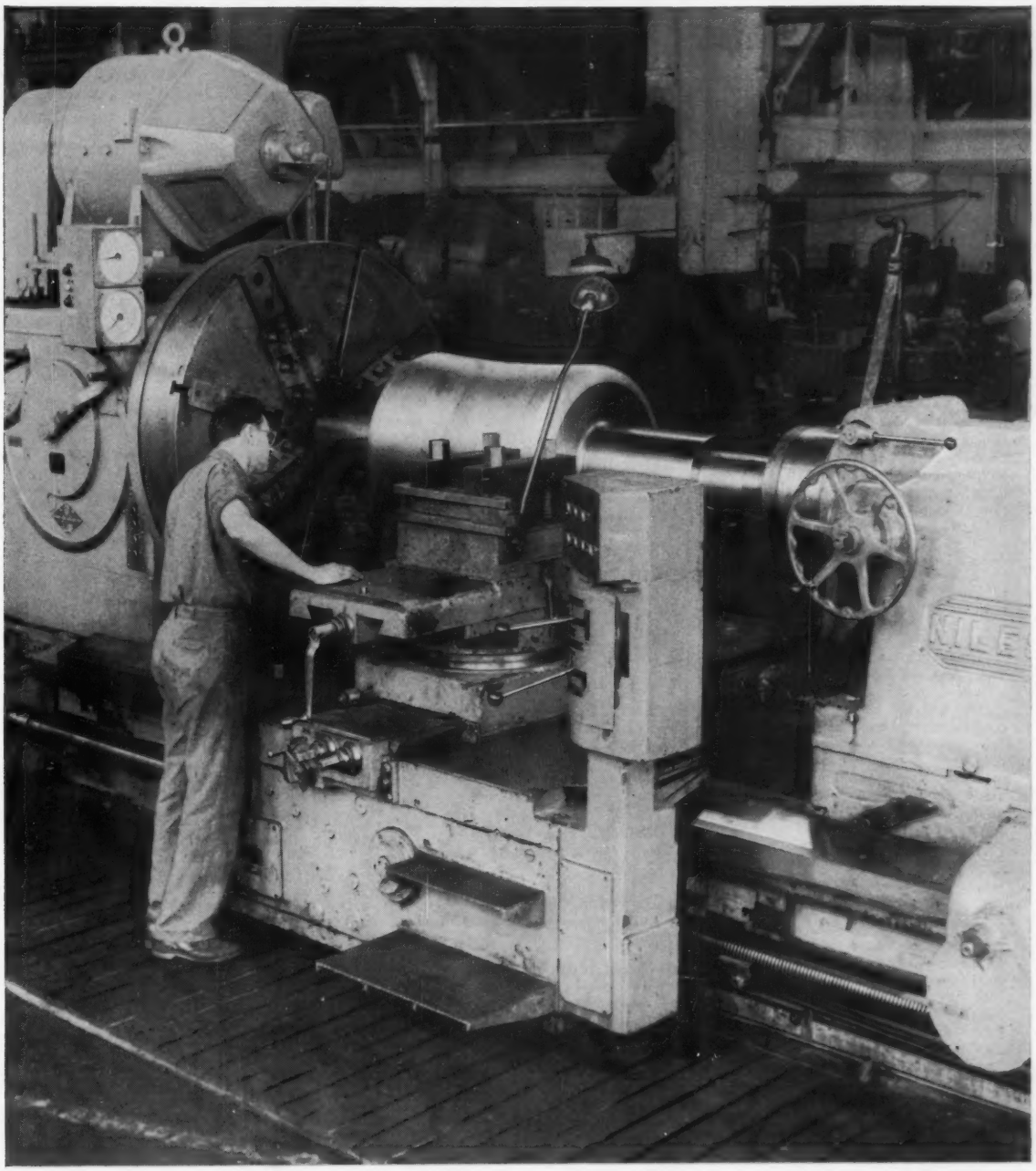
(*Continued on page* 342)



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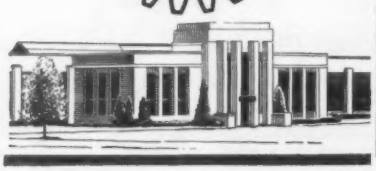

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Brown & Sharpe Mfg. Co., Providence, R. I.
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Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
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Kennametal Inc., Latrobe, Pa.
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Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
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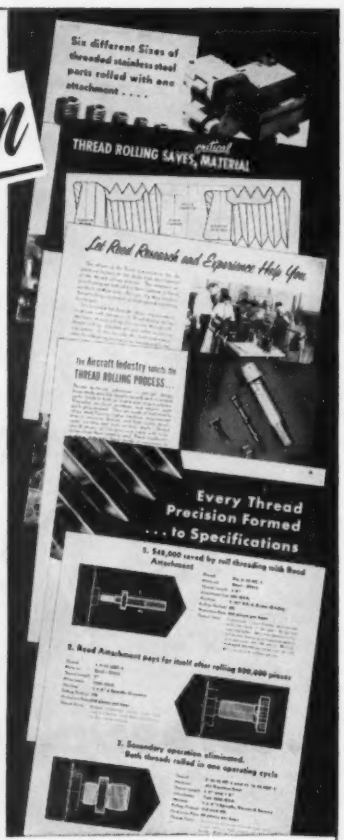
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Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
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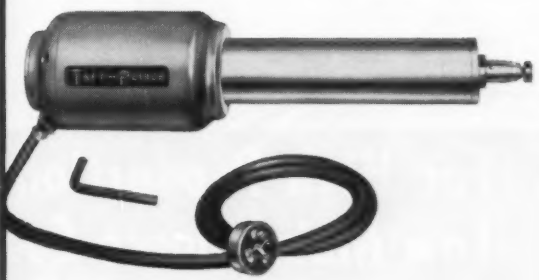
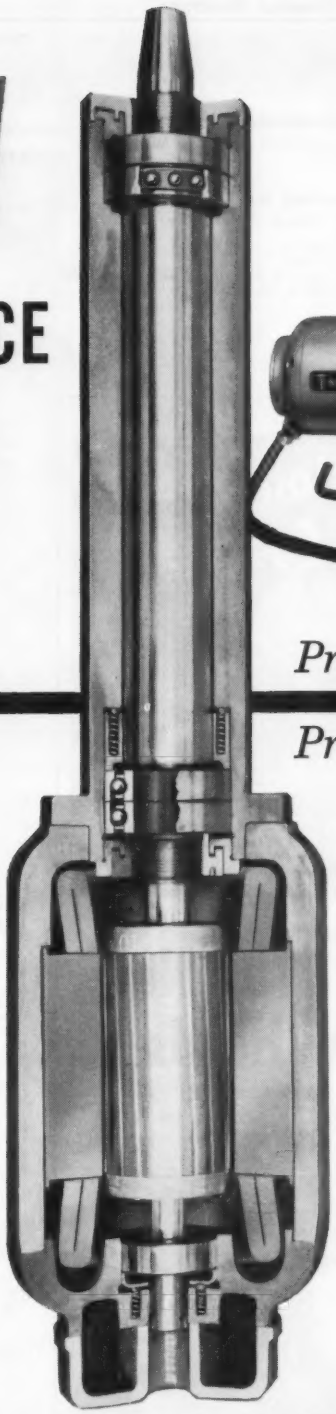
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

(*Continued on page* 346)

NEW

TAFT-PEIRCE GRINDING SPINDLE





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Precision and Finish

Here's a new model Grinding Spindle that permits the very finest micro-inch finishes. Ideal for surface grinders and many other machine tools, this new T-P Grinding Spindle offers a long list of quality features.

Precision balanced on its one bearing

Low operating temperature

Rugged internal construction eliminates deflection and vibration

Springs assure constant uniform preload — no maintenance required

Labyrinth sealing system eliminates drag or wear

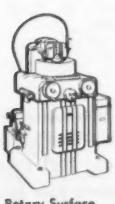
Spindle shaft is hardened and completely finish-ground for alignment and balance

Simple holding means for mounting wheel thimbles

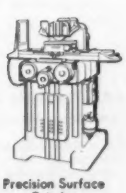
Built with the utmost care and precision for our own use, this spindle is now available as a standard product. Write for details.

SPECIFICATIONS

Motor — 1 h.p.
Speed — 3600 r.p.m.
Quill — 3" diameter
Nose Taper — 3" per foot
Length — 23½" overall
Lifetime lubrication

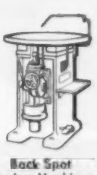


Rotary Surface Grinders



Precision Surface Grinders

Lapping Machines



Back Spot Facing Machines

T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY • WOONSOCKET, RHODE ISLAND

GEAR FINISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR GRINDING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17.
Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Lees-Bradner Co., Cleveland, Ohio
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., Springfield, Mass.

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS

See Speed Reducers.

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Lees-Bradner Co., Cleveland, Ohio
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS, Cut

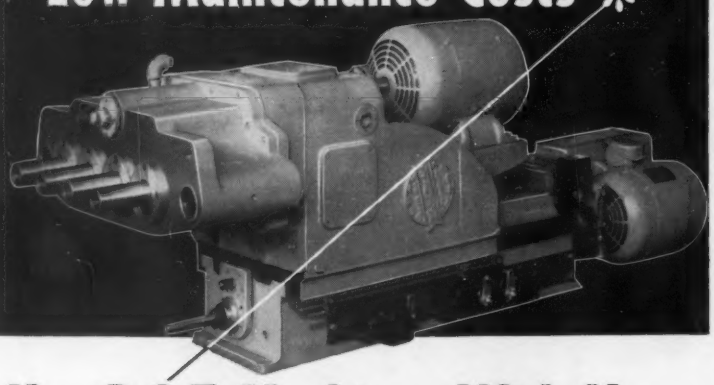
Automotive Gear Works, Inc., Richmond, Ind.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Fairfield Mfg. Co., 2309 S. Earl Ave., Lafayette, Ind.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.
Lees-Bradner Co., Cleveland, Ohio
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
New Jersey Gear Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Pittsburgh Gear Co., Neville Island, Pittsburgh 25, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.

(*Continued on page* 348)

For High Production and Low Maintenance Costs *



Use D&T Machines With New Mechanical Power Heads

Here are two good examples of special machine tools designed and built with D & T mechanical power heads. Shown above, is the No. 2 Roto-Matic 10 H.P. head. All sizes are operated through screw feed and have overload release clutch on the feed. Simplicity of design makes for less servicing and lower maintenance costs. D & T Roto-Matic power heads are readily adapted to countless special machine designs. For instance: Machine to the right is a 6 station indexing machine with 3 horizontal and 3 vertical power heads. Operations are drilling and reaming suspension holes and king pin holes in support arms for power heads.

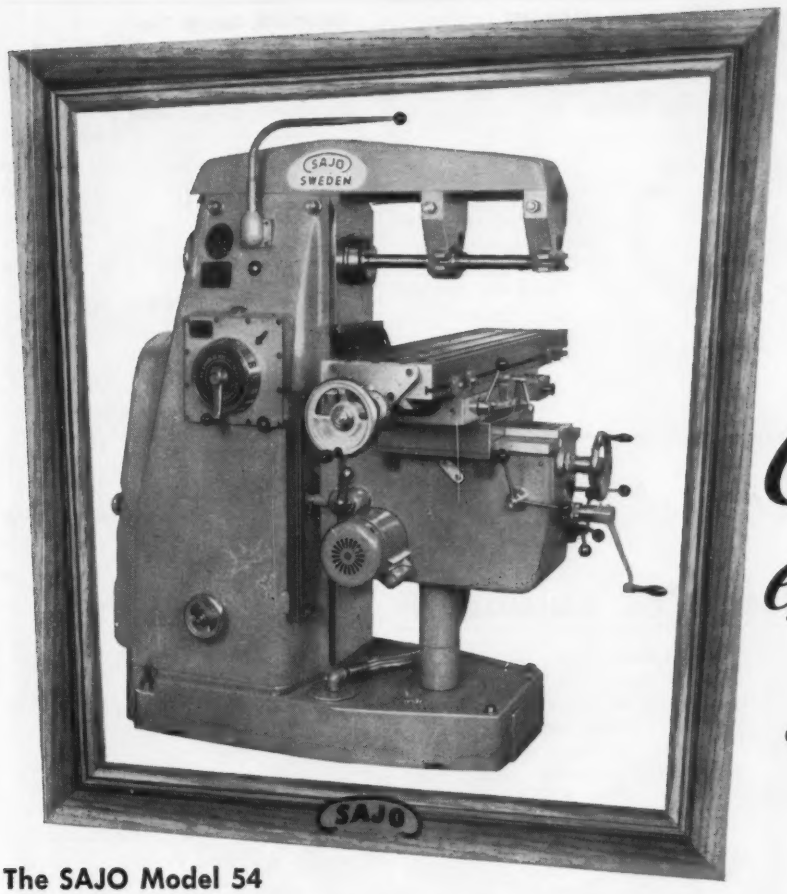
Free Data

is available on the complete line of D & T machines. Ask for Bulletin 1000.

DAVIS and THOMPSON Roto-Matic

Davis & Thompson Company

6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN



Classic example

OF SWEDISH CRAFTSMANSHIP

The SAJO Model 54
No. 2 ALL-GEARED Milling, Machine Plain or Universal

is an outstanding example of Swedish craftsmanship and fine quality materials, combined in a modern design.

Capable of continuous dependable service under the most severe conditions and guaranteeing maintenance of accuracy to tenths, the SAJO Model 54 Millers meet all requirements for:

POWER . . . . . 7½ HP motor drive to spindle (5 HP optional).
1½ HP table feed and rapid traverse motor.

RANGE . . . . . 16 spindle speeds 39-1500 RPM (optional 31-1200 RPM).
12 table feeds 11/16" to 25"/min. longitudinal and cross.
11/32" to 12½"/min. vertical.
Power rapid traverse 96"/min. longitudinal and cross. 48"/min. vertical.
Table travel longitudinal 33½". Cross 10". Vertical 18".

ACCURACY . . . . Handscraped sliding surfaces, Spindle (#50 NMT taper) mounted in four precision SKF bearings ensuring constant smooth operation and fine finish.

SIMPLICITY . . . . . Single adjustable START-STOP-BRAKE lever, Dial selection of speeds and feeds.

Priced well below levels of comparable top grade millers.

Prompt delivery. Full selection of accessories available.

Also available: SAJO No. 2 Light Duty Plain or Universal Millers.

For information write to:

austin industrial corp.

76-E MAMARONECK AVE., WHITE PLAINS, N.Y.
Dealers in principal cities

Look for the Austin Seal—your full guarantee of satisfaction.

For more information on products advertised, use Inquiry Card, page 243

Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Pittsburgh Gear Co., Neville Island, Pittsburgh 25, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schnectady 5, N. Y.
Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio

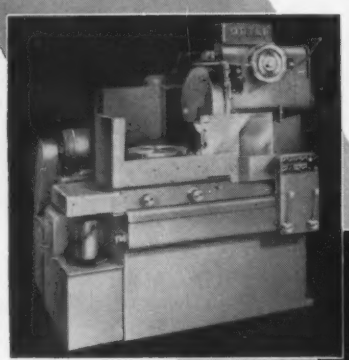
GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia.
Texas Co., 135 E. 42nd St., New York, N. Y.

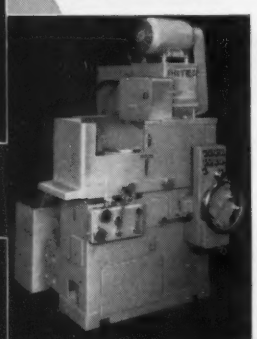
ARTER

FAMILY OF GRINDERS

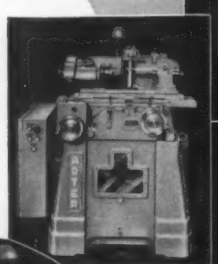
A GENERATION of experience stands behind the ARTER family of grinding machines. Progressively these machines have attained advanced techniques, simplification of grinding processes, closer tolerances. Today ARTER is proud of the family especially the newest members, Models E and F Rotary Surface Grinders.



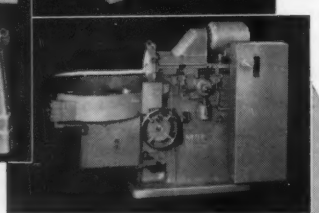
MODEL E — 12" AND 16" ROTARY SURFACE GRINDER



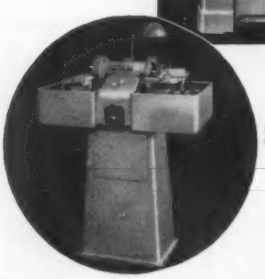
MODEL F 12" ROTARY SURFACE GRINDER



MODEL 103— CYLINDRICAL AND INTERNAL GRINDER



MODEL D—SPECIAL SEMI-AUTOMATIC ROTARY SURFACE GRINDER ARRANGED WITH WORK-LOADING AND PUSH BUTTON GRINDER CYCLE



MODEL 200 CARBIDE TOOL GRINDER

ARTER GRINDING MACHINE CO.
WORCESTER • MASSACHUSETTS
Agents in industrial centers of United States and Canada

GRINDERS, Carbide Tool

See Grinding Mches., Carbide Tool

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

GRINDERS, Portable Electric and Toolpost

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Millers Falls Co., Greenfield, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDING FIXTURES

Geometric Tool Co., (Die Chaser), Westville Station, New Haven 15, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GRINDING MACHINES, Abrasive Belt

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Atlas Press Co., Kalamazoo, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio.

GRINDING MACHINES, Broach

Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

(*Continued on page* 350)

BRUSHAMATION BY OSBORN

The parts shown above are typical of the work you can now handle with Osborn's line-production power brushing method... ***BRUSHAMATION.***

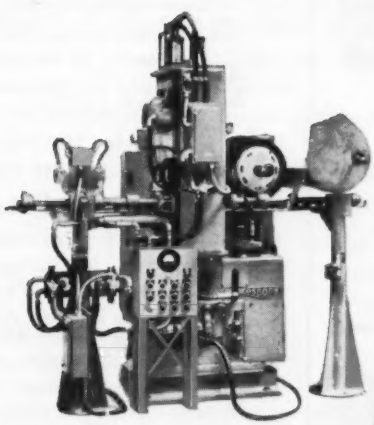
COMPLETELY INTEGRATED...Osborn's Automated Brushamatic® Equipment fits right into your production line.

ELIMINATES BOTTLENECKS. It is now possible to remove burrs, blend surface junctures, remove weld scale, clean parts on a continuous line-production basis.

AUTOMATES FINISHING OPERATIONS ... takes parts right from your production lines, feeds them to rotating power brushes, delivers them precision-finished to micro-tolerances where necessary

... all without manual handling.

Qualified engineers will show how you can benefit with automated brushing at the Osborn Booth 718, The Metal Show, Philadelphia, Oct. 17-21. If you can't make the show, write us for complete information. *The Osborn Manufacturing Company, Dept. C-54, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



AUTOMATED BRUSHAMATIC®... One of Osborn's integrated production line automatic power brushing machines.

Osborn Brushes

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OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

For more information on products advertised, use Inquiry Card, page 243

Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernon Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Waynesboro, Pa.
Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Chucking
Baird Machines Co., 1700 Stratford Ave., Stratford, Conn.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Bullard Co., Brewster St., Bridgeport, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Crankshaft
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Cylindrical
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Van Norman Co., 2640 Main St., Springfield 7, Mass.

GRINDING MACHINES, Die Chaser
Eastern Mch. Screw Corp., New Haven, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Disc
Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDING MACHINES, Drill
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Face
Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio
Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GRINDING MACHINES, Flexible Shaft
See Flexible Shaft Equipment

GRINDING MACHINES, Gap
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth
See Gear Grinding Machines

GRINDING MACHINES For Sharpening Cutters, Reamers, Hobbs, Etc.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, For Sharpening Turning and Planing Tools
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

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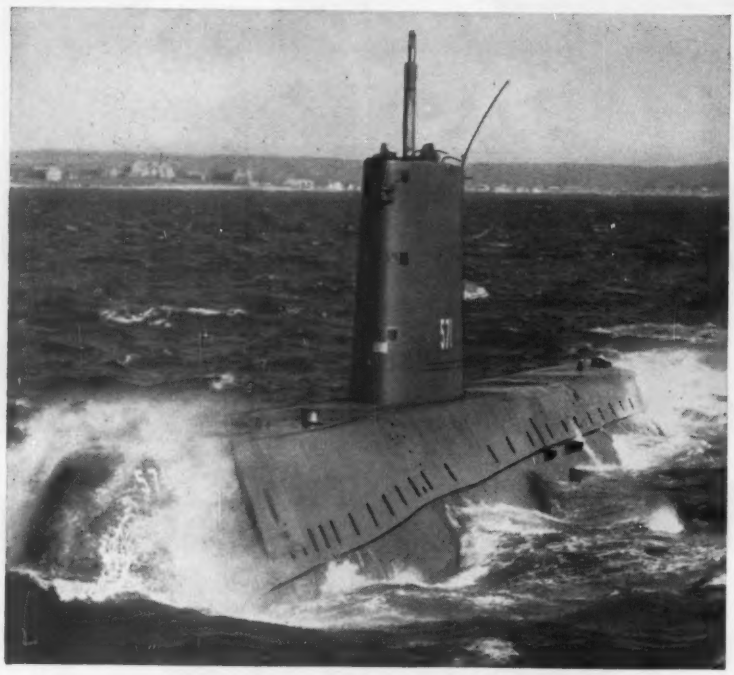
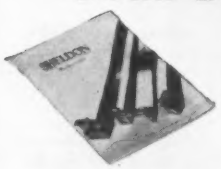


Down Deeper... Below Longer



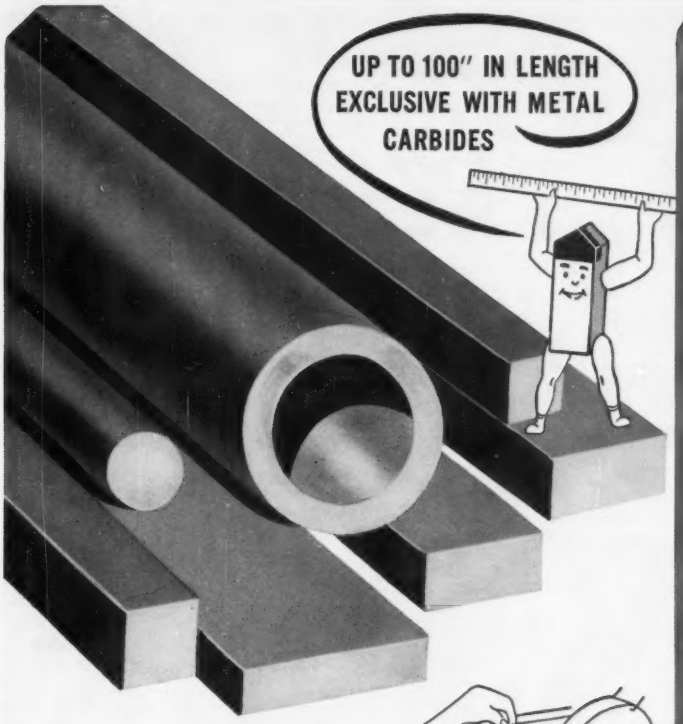
Write for new 1955 catalog of Sheldon Machine Tools

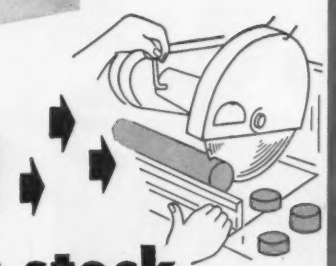
With those privileged to make atomic and submarine history on the Nautilus (and more recently on the Sea Wolf) was a SHELDON Lathe. Although probably the proudest, most significant voyage, this was not the first time SHELDON Lathes had gone to sea with the U. S. Navy. Since World War II, SHELDON Lathes have been the maintenance lathes on naval craft of many types.

SHELDON

Builders of Sheldon Lathes, Milling Machines, Shapers and Sebastian Lathes

Sheldon Machine Co., Inc. • 4246 N. Knox Ave., Chicago 41, Illinois





first to offer

carbide bar stock cut to length

Now you can buy super hard **Talide Bar Stock** in bars, strips or rods; in standardized sizes from 1/16" square to ¼" x ¾" rectangular; tubes 1/16" to ⅜" O. D.; rods 1/16" to ½" diameter . . . IN ANY LENGTH. Complete stocks are available at these warehouses:

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Detroit, Mich. . . . . 20485 Van Dyke
Youngstown, O. . . . . 107 E. Indianola Ave.
Chicago, Ill. . . . . 4244 W. Diversey Ave.

Metal Carbides stocks 1325 different sizes of standard, solid Talide Metal in bars, strips, rods, tubes, bushings, rings, flats, tips and discs for immediate shipment. Special shapes furnished up to 25" O.D. in any length and up to 5000 lbs. per piece by weight —for every die and wear part application.

● Metal Carbides produces only top quality metal in latest type vacuum furnaces. From ore to finished product, all operations are rigidly controlled in our new multi-million dollar plant of over 100,000 sq. ft. Write for Catalog 55-G. Metal Carbides Corporation, Youngstown 7, Ohio.

Only Metal Carbides Produces both Sintered and Hot Pressed Carbides

METAL CARBIDES CORPORATION
MC
TALIDE®
YOUNGSTOWN 7, OHIO

HOT PRESSED AND SINTERED CARBIDES · VACUUM METALS
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

For more information on products advertised, use Inquiry Card, page 243

Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
South Bend Lathe Works Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.

GRINDING MACHINES, Jig

Moore Special Tool Co. Inc., 724 Union Ave., Bridgeport, Conn.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
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(Continued on page 354)

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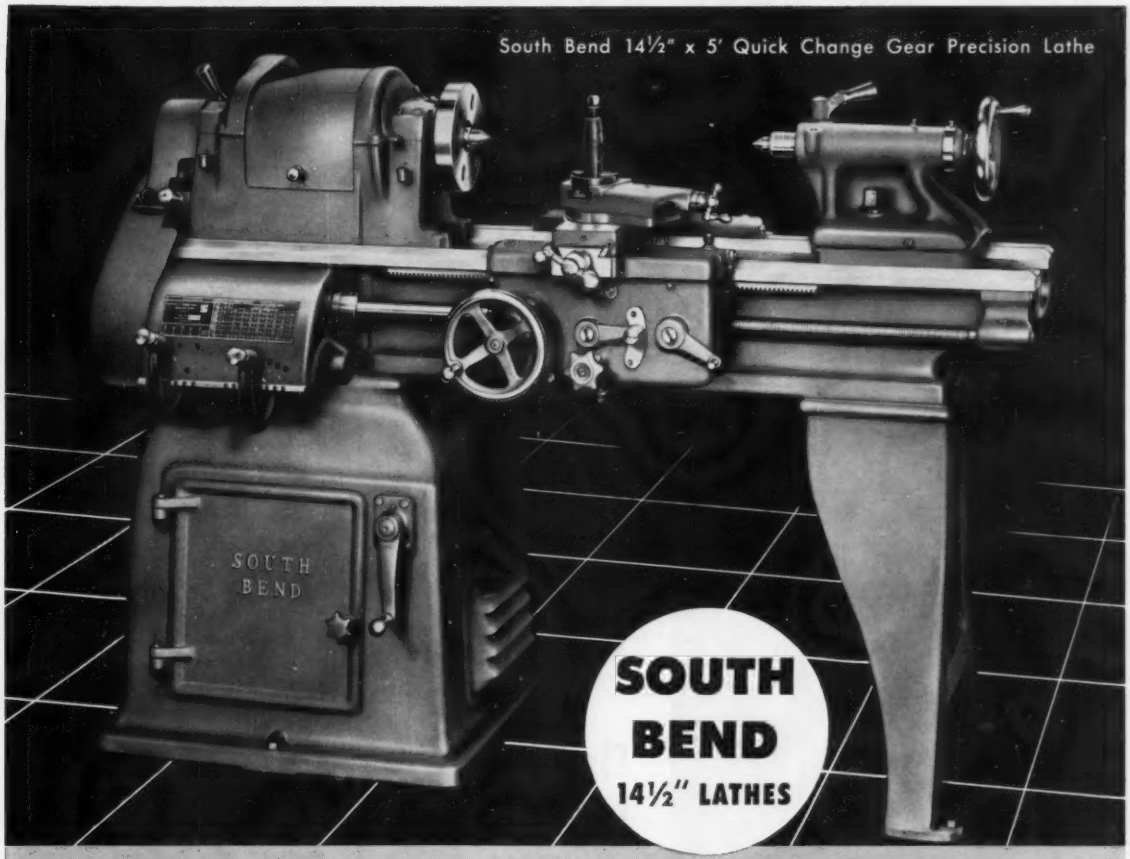

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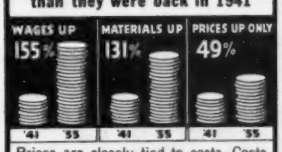

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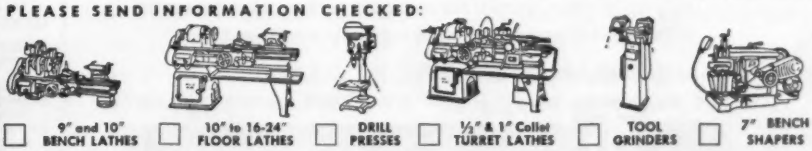

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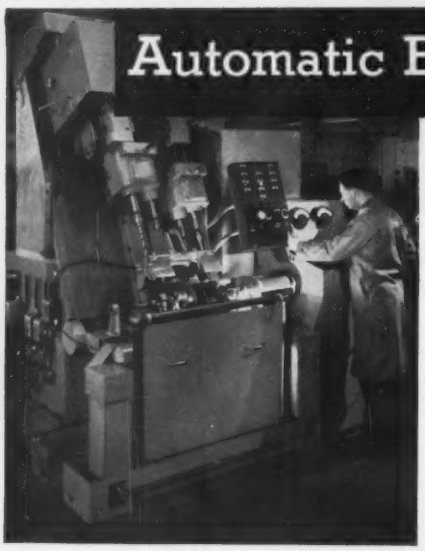
(*Continued on page* 356)



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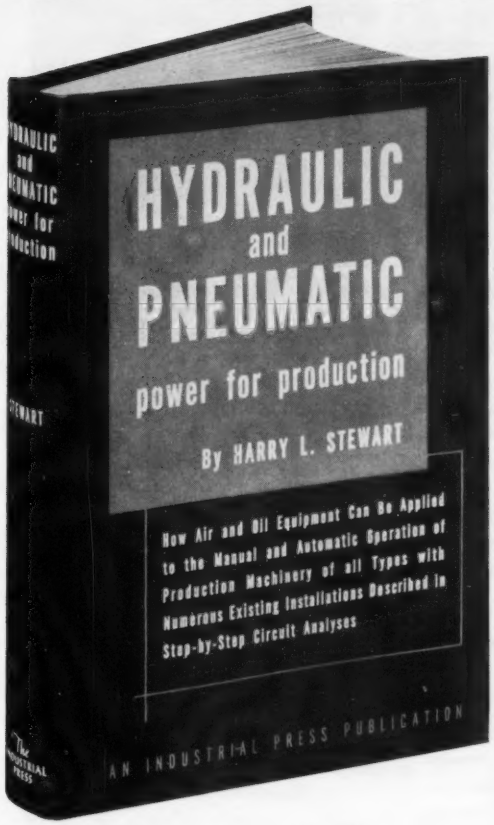
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Taft-Peirce Mfg. Co., Woonsocket, R. I.

(*Continued on page* 358)

MICROHONING* . . . FACTS YOU SHOULD KNOW

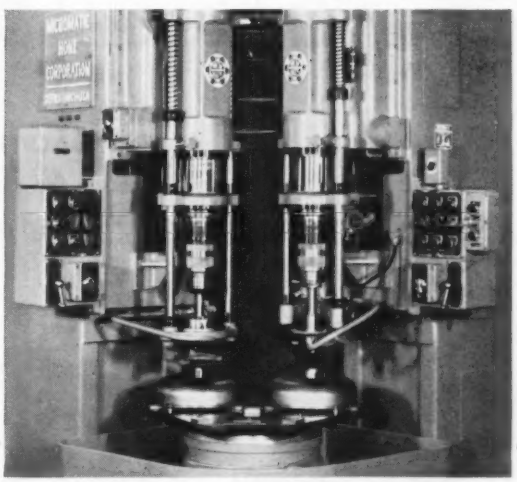
Compare These Microhoning Advantages

- Rapid and efficient stock removal.
- Dimensional accuracy obtained in every part.
- Macrogeometric accuracy—the Microhoning action is not affected by vibration; long abrasive stones generate a true surface.
- Microgeometric accuracy—any desired surface finish and cross-hatch angle duplicated in every part.
- No concentration of heat—the structural surface of the part is undamaged.
- Microhoning applications include tapers, spheres, splines, tandem or interrupted bores, flat surfaces, and any type of material, regardless of hardness (or softness).
- No practical limitation on part length and diameter.
- No chip removal problem—the minute Microhoning chips are flushed away in the coolant and automatically removed.
- Automatic size control.
- Readily adapted to automation.
- Eliminates tool dressing time and cost.
- Location of bores is undisturbed.
- Float principle and low speeds assure minimum maintenance.
- Backed by over 26 years of engineering and service experience.

PRECISION PRODUCTION THROUGH MICROHONING — MICRO MATIC — TRADE MARK

Microhoning is a low-velocity abrading process that employs thousands of small cutting tips. Because simultaneous and continuous cutting action of tips is spread over a wide area, stock is rapidly removed with a minimum of heating. This abrading technique generates functional surfaces ***by obtaining in one operation the required tolerances, specifications, or condition*** of the surface characteristics.

Included in these characteristics are: dimensional size (the distance between points or faces of a part, e.g., the diameter of a bore); macrogeometry (waves whose crests are more than 1/32" apart); microgeometry (roughness or scratches whose crests are less than 1/32" apart); and surface structure.



Microhoning . . . Example Application

Microhoning both I.D. and O.D. of the hub of a transmission torus cover to generate geometric accuracy and a surface finish of 10 microinches.

O.D.—*2.375", approx. 1" long, blind end*
I.D. —*2.125" x .280" long*
58-60 Rockwell "C"
Stock removal: *.001" to .002"*
Surface finish: *10 microinches*
Production: *180 per hour, gross.*

***MICROHONING = Stock Removal + Geometry + Size Control + Surface Finish**

Movies describing various machining processes and the generation of functional surfaces are available for group meetings. For literature or further information on films, write to:

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Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Jones & Lamson Mch., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
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Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
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Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sidney Machine Tool Co., Sidney, Ohio
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio
Sundstrand Mch. Tool Co., 2431 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio

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Bullard Co., Brewster St., Bridgeport 2, Conn.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
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Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
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Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
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National Acme Co., 170 E. 131st St., Cleveland, Ohio
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Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

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Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
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Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
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Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

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Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

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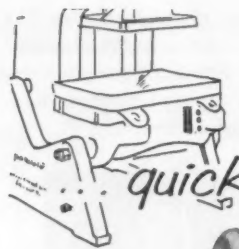
Hydro-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio
Sidney Machine Tool Co., Sidney, Ohio

(Continued on page 360)



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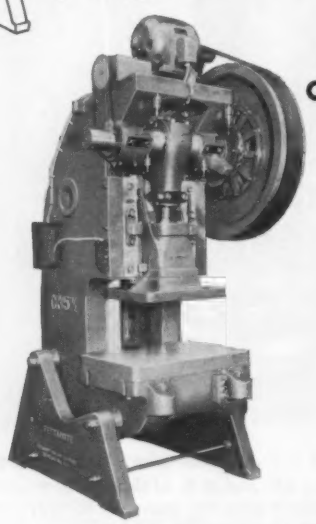

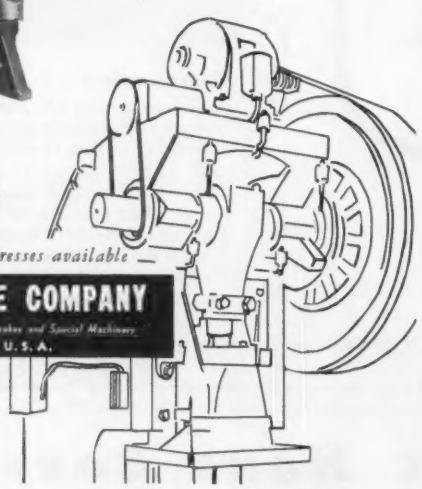

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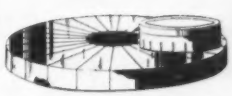

6 Lap plate always kept in condition while in operation. No down time required for truing or reconditioning.

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Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio
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LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
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Potter & Johnson Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
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Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
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Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
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Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
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(*Continued on page* 362)

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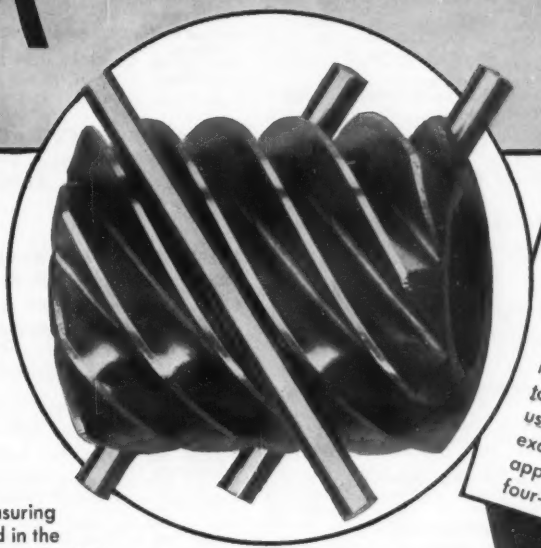

Thread Measuring Wires placed in the grooves of an eight-start worm. Wires on the further side of the worm are separated by one thread groove. VK Catalog and Handbook No. 36 contains formulas and illustrations showing contact position of wires.

Van Keuren Measuring Wires are held to within .00002" for roundness, straightness and identity of the wires within a set, and are also held within .00002" of exact size. They are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, hobs, worms, splines and gears. For the great majority of 60° Unified and American threads, the Set No. 20 pictured at the right will fill your needs. Similar sets are available for single-start threads of other pressure angles. For threads which have a lead angle greater than five degrees, or multiple-start threads and worms, special size wires should be used. Correct sizes and constants can be easily determined from the Van Keuren Thread Measuring Tables or from the new formulas presented in Catalog and Handbook No. 36.

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Price, Carbide Wires 450.00

Special wires from .002" to 2.000" diameter are made to any tolerance required.

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36th YEAR

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Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
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Snyder Tool & Engrg. Co., 3400 E. Lafayette Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Hand

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
U. S. Burke Machine Tool Div., Brotherton Rd., Cincinnati 27, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Horizontal, Plain and Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., Milwaukee, Wis.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Pratt & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Planer Type

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn. R. R. Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co. 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Ram Type Universal

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Turret Type

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Bridgeport Machines, Inc., Linley Ave., Bridgeport, Conn.

MILLING MACHINES, Vertical

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Burke Machine Tool Div., Cincinnati 27, Ohio.

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools

MOLD AND DIE COPYING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Erie Foundry Co., Erie, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Howell Electric Motors Co., Howell, Mich.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

MOTORS, Hydraulic

Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MULTIPLE-SLIDE FORMING MACHINES

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

GENERATED HELICAL ROD

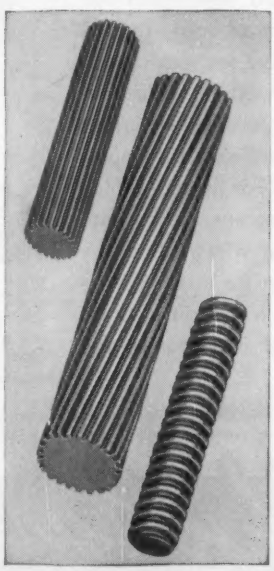
Mass Gear can generate spur, helical and worm pinion rod in all types of material including plastic.

Mass Gear can also produce any type of serrated or special form rod that can be generated.

These rods are available up to 6 feet in length, from 5/32" to 1 ¼" in diameter.

Mass Gear products are made to A.G.M.A. standards, thus insuring uniform quality.

Illustrated brochure showing interesting designs and suggestions available upon request.



G&T Co.

Massachusetts Gear & Tool Co.
WOBURN, MASS.

NIBBLING MACHINES
International Nickel Co., Inc., 67 Wall St., New York, N. Y.
Wales-Strippet Corp., North Tonawanda, N. Y.

NIPPLE THREADING MACHINERY
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT
See Screw Driving and Nut Setting Equipment.

NUT TAPPERS
See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap
Chicago Screw Co., Bellwood, Ill.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Union Drawn Steel Co., Div., Republic Steel Corp. Massillon, Ohio.

NUTS, Self-locking
Grip Nut Co., 310 S. Michigan Ave., Chicago 4, Ill.

NUTS, Thumb or Wing and Cap
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

OIL EXTRACTORS AND CLEANERS
De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS
Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.

OIL SEALS
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

OILERS AND LUBRICATORS
Madison-Kipp Corp., Madison, Wis.

OILS, Cutting
See Cutting and Grinding Fluids.

OILS, Lubricating
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 5th Ave., New York.
Socony Mobil Co., Inc., 26 Broadway, New York, N. Y.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

OILS, Quenching and Tempering
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 5th Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.

OILS, Soluble
See Compounds, Cutting, Grinding, Metal Drawing, Etc.

OPTICAL FLATS
Crane Packing Co., 1800 Cuyler Ave., Chicago.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

ORDNANCE MACHINES, Spelial
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.

PAINTING EQUIPMENT, Spray
Lowe Bros. Co., Dayton, Ohio.

PARALLELS
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal
Mummert-Dixon Co., Hanover, Pa.

PILLOW BLOCKS
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

PIPE, Brass and Copper
American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

PIPE, Steel
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
United States Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

PIPE THREADING AND CUTTING MACHINES
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.

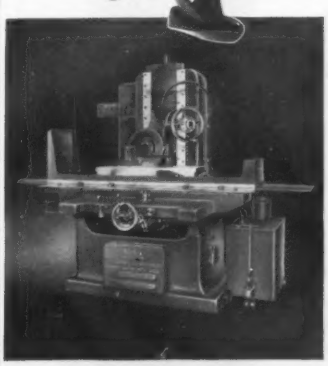
PIPE TONGS
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

PLANER ATTACHMENTS
Consolidated Mch. Tool Corp., Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn R. R. Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

(*Continued on page 364*)

FOUND WHERE WORLD FAMOUS AIRCRAFT ARE "BORN"

GRAND RAPIDS GRINDERS



Just take a look in their toolrooms! Every one of these famous aircraft manufacturers uses Grand Rapids Grinders . . . engineered and built for unusual long life of precision grinding. Our Model 55 shown here, for instance, features column and base of massive, one-piece casting for vibrationless rigidity and permanent alignment. Both longitudinal table travel and cross feed are hydraulically actuated. Wheel head has powered rapid vertical travel. Table speed is variable up to 125 fpm . . . faster than any other of this type and size.

That's why so many tool room men insist on Grand Rapids Grinders.

Grand Rapids No. 55 Hydraulic Feed Surface Grinder
Table speed up to 125 fpm. Working surface of table is 12" x 36". Vertical movement of wheel head 18". Preloaded ball bearing spindle greased for life. Spindle speeds 1925 and 2500 rpm.

Just a note on your letterhead will bring you full details.

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GALLMEYER & LIVINGSTON COMPANY 305 Straight Ave., S.W., Grand Rapids, Mich.

PLANERS

Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

PLANERS, Double Housing and Openside

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio (Plate).
Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A. Co., Woodburn Ave., and Penn R. R. Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

PLATE ROLLS

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

PLATES, Angle

Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.

PLATES, Surface

Brown & Sharpe Mfg. Co., Providence, R. I.
Brush Electronics Co., 3405 Perkins Ave., Cleveland, Ohio.
Challenge Machinery Co., Grand Haven, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Pratt & Whitney Div., West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

PNEUMATIC EQUIPMENT

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Onsrud Machine Works Inc., 3940 Palmer St., Chicago, Ill.

POLISHING LATHES AND MACHINES

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Millers Falls Co., Greenfield, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POLISHING TOOLS, Portable

Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool Heads

PRESSES, Arbor

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
duMont Corp., Greenfield, Mass.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Threadwell Tap & Die Co., Greenfield, Mass.
Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

PRESSES, Forging

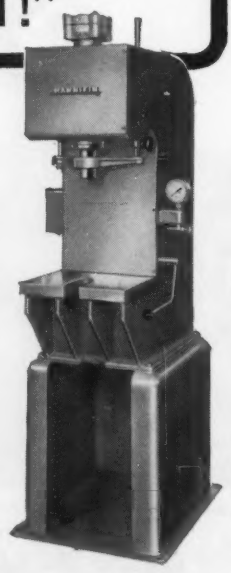
Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg., Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PRESSES, Hydraulic

American Broach & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel So., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Cch. Co. (Hydroform), Cincinnati 9, Ohio.
Cincinnati Milling Mch. Co. (Hydroform), Cincinnati 9, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Detroit Broach Co., (special & semi-special) P. O. Box 156, Rochester, Mich.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Federal Mch. & Welder Co., Warren, Ohio.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.

(*Continued on page* 365)

"BEST $1286 WE EVER SPENT!"



That's the price of this 5-Ton HANNIFIN Press*

A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

Hannifin Corporation, 509 S. Wolf Road, Des Plaines, Illinois

Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

PRESSES, Sheet Metal Working

Allen, Alva F., Box 426, Clinton, Mo. (Bench)
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cincinnati Milling Mch. Co. (Hydroform), Cincinnati 9, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 50, Ill.
Erie Foundry Co., Erie, Pa.
Espen-Lucas Machine Works, Front St., and Girard Aves., Philadelphia, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Machine & Tool Works (Hydraulic), 683 Northland Ave., Buffalo, N. Y.
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Allsteel Press Co., 93rd St. & Kenwood Ave., Chicago, Ill.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PROFILE—TRACING ATTACHMENTS

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa. (Lathe).

PROFILING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George Machine Co., 1110 W. 13th St., Racine, Wis.
Morey Machinery Co., Inc., 383 Lafayette St., New York 3, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co., Providence, R. I.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tompkins-Johnson Co., Jackson, Mich.
Vickers Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll-Rand Co., Phillipsburg, N. J.

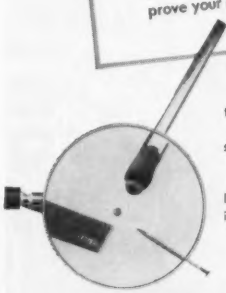
(*Continued on page 366*)

5419

PRECISION GEARS

YOU who use small gears, (to 6" O.D. of the gear blank) can improve the performance of your product, through increased gear precision, without sacrifice of gear production.

YOU who use small, fine pitch, precision gears can increase your gear production without sacrifice of gear accuracy, or improve your gear accuracy without sacrifice of gear production.



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Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

PUMPS, Rotary

Brown & Sharpe Mfg. Co., Providence, R. I.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Sier-Bath Gear & Pump Co., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

PUNCHES, Centering

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

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Allen, Alva F., Box 426, Clinton, Mo.
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Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Engineering & Research Corp., Riverdale, Md.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Joseph T., & Son Inc., 2558 W. 16th St., Chicago 18, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.
Wiedermann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

RACKS, Gear Cut

Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

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Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

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Ace Drill Corp., Adrian, Michigan.
The Atrax Co. (Carbide), 240 Day St., Newington 11, Conn.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Cabide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Jarvis Corp., Middletown, Conn.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

REAMERS, Adjustable

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Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
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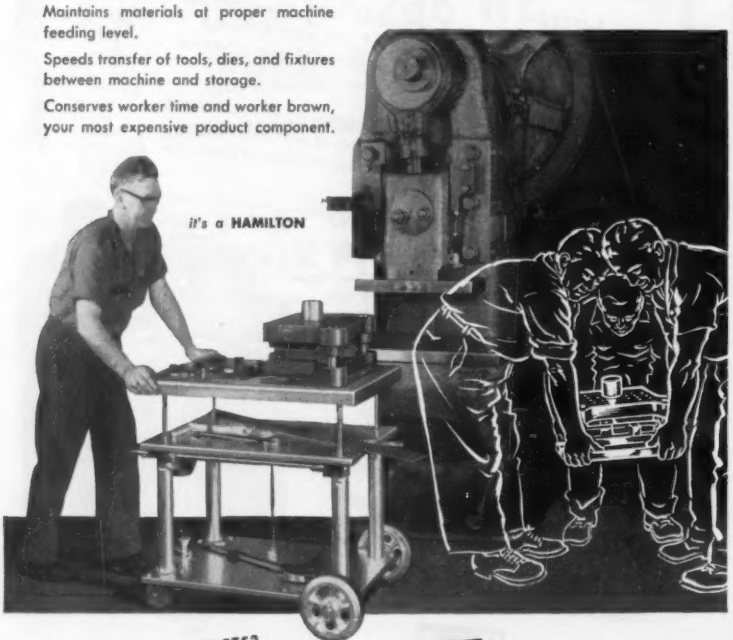

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Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

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Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Kaufman Manufacturing Co., Manitowoc, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

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National Acme Co. (for counting), 170 E. 131st St., Cleveland, Ohio.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

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REFRACTORS, Heat-Treating Furnace

Norton Co., 1 New Bond St., Worcester 6, Mass.

REGULATORS, Temperature

General Electric Co., Schenectady, N. Y.

REMOVERS, Japan, Enamel, Etc.

Oakite Products, Inc., 19 Rector St., New York, N. Y.

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General Electric Co., Schenectady, N. Y.

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Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

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Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.

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Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Ingersoll-Rand Co., Phillipsburg, N. J.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Wood & Co., R. D. Public Ledger Bldg., Philadelphia, Pa.

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Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
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Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
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Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.

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Ingersol-Rand Co., Phillipsburg, N. J.
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Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

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Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S. Co., Athol, Mass.

(*Continued on page* 368)

5408

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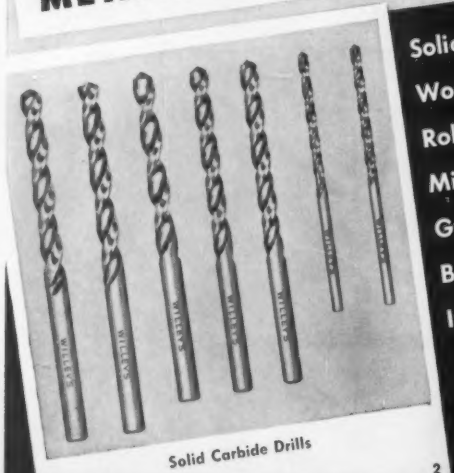

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Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
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Grob, Inc., Grafton, Wis.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

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Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Ryerson, Joseph T., & Son Inc., 2558 W. 16th St., Chicago 18, Ill.

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Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Consolidated Mch. Tool Corp., Rochester, N. Y.
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Johnson Mfg. Co., Albion, Mich.
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Union Twist Drill Co., Athol, Mass.

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Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.

SAWS, Portable Electric

Millers Falls Co., Greenfield, Mass.

SAWS, Screw Slotting

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Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

SCRAPERS, Hand and Power
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

SCREW DRIVERS, Power
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

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Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
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Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
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Potter & Johnson Co., 1027 Newport Ave., Pawtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
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Standard Pressed Steel Co., Jenkintown, Pa.
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Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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See also Lathes, Turret
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Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
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Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

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Chicago Screw Co., Bellwood, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Self-tapping, Drive
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.

SCREWS, Thumb
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
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(*Continued on page 370*)

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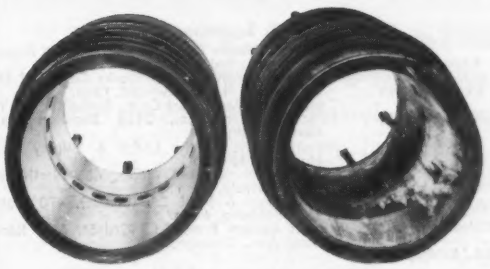

Illustration shows electromotive Diesel liner before and after being honed to .030" oversize

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Standard Pressed Steel Co., Jenkintown, Pa.

SHAFTS, Hollow-Bored
Bethlehem Steel Co., Bethlehem, Pa.

SHAFTS, Turned and Ground
Bethlehem Steel Co., Bethlehem, Pa.
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Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Smith & Mills Shapers, Inc., Div. Hamilton-Thomas Corp., Hamilton, O.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

SHAPERS, Vertical
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPES, Structural
Bethlehem Steel Co., Bethlehem, Pa.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEARING MACHINERY
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E. Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

SHEARS, Alligator
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

SHEARS, Rotary
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E. Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

SHEARS, Squaring
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E. Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Simonds Saw & Steel Co. (Blades), 470 Main St., Fitchburg, Mass.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

SHEET METALS
American Brass Co., 25 Broadway, New York, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
New Jersey Zinc Co., 160 Front St., New York, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEET METAL MACHINES, Shrinking, Stretching, Forming & Flanging.
Engineering & Research Corp., Riverdale, Md.

SHEETS, Iron and Steel
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHIMS
Laminated Shim Co., Inc., Glenbrook, Conn.

SLEEVES
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.

SLOTTING MACHINES
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Lobdell United Div., United Engrg. & Foundry Co., Wilmington 99, Del.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SOCKETS
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Wks., 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

SPECIAL MACHINERY AND TOOLS
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Baker Bros., Inc., Sta. F., P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bethlehem Steel Co., Bethlehem, Pa.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. C.
Coulter, James, Machine Co., Bridgeport 5, Conn.
Cross Co., Detroit, Mich.
Erie Foundry Co., Erie, Pa.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hydraulic Press Mfg. Co., 30 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
La Salle Tool Co., Inc., 3840 E. Outer Drive, Detroit 34, Mich.
Lemert Engrg. Co., Inc., 210 E. Jefferson St., Plymouth, Ind.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Mercury Engrg. Corp., Milwaukee, Wis.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S 7th and N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Twist Drill & Tool Co., Rochester, Mich.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Waltham Machine Works, Newton St., Waltham, Mass.
Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.
Zagar Tool Co., 24000 Lakeland Blvd., Cleveland 23, Ohio.

SPEED REDUCERS

Boston Gear Work, 320 Main St., North Quincy 71, Mass.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears, Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
General Electric Co., Schenectady, N. Y.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

SPINDLES, Boring and Milling

Pope Mchry. Corp., Haverhill, Mass.

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Pope Mchry. Corp., Haverhill, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

SPINNING LATHES

See Chucking Machines.

SPROCKET CHAINS

Boston Gear Work, 3200 Main St., North Quincy 71, Mass.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

SPROCKETS

Boston Gear Work, 3200 Main St., North Quincy 71, Mass.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

STAMPINGS, Sheet Metal

Laminated Shim Co., Inc., Glenbrook, Conn.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.
Winzeler Mfg. & Tool Co., 1712 W. Arcade Pl., Chicago12, Ill.

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 Ave., Pittsburgh, Pa.
Wheeler-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Cold Drawn

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, Oliver Bldg. Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co., Div., 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg. Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

(Continued on page 372)

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STEEL, Machine
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg. Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg. Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburah 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Strip and Sheet
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

STEEL, Tool and Die
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg. Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL ALLOYS
See Alloys, Steel

STEEL BARS
See Bars, Steel

STEEL STOCK GROUND FLAT
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S., Co., Athol, Mass.

STELLITE
Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

STOCKS, Die
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. of Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., Greenfield, Mass.

STONES, Oil or Sharpening
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.

STOOLS
Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTEDGES
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

STRAIGHTENERS, Flat Stock and Wire
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

STRAIGHTENING MACHINERY
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N.Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

STUD SETTERS
Errington Mechanical Laboratory Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.

SUB-PRESSES
Waltham Machine Works, Newton St., Waltham, Mass.

SUPERFINISHING MACHINES
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE CHECKING EQUIPMENT
Micrometrical Mfg. Co., 321 S. Main St., Ann Arbor, Mich.

SURFACE PLATES
See Plates, Surface

SWAGING MACHINES
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.
Lemert Engrg. Co., Inc., 210 E. Jefferson St., Plymouth, Ind.

SWITCHES
Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

TACHOMETERS
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

TANGS, Replaceable, Drill & Reamer
Nu-Tangs Inc., 1335 Bates St., Cincinnati, Ohio.

TAPER PINS, Standard
Chicago Screw Co., Bellwood, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.

TAP HOLDERS
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Co., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

TAPPING ATTACHMENTS AND DEVICES
Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Jarvis Corp., Middletown, Conn.
Leland-Gifford Co., 1425 Southbridge St., Worcester, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

TAPPING MACHINES
Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 70, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wasson Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Challenge Mchry. Co., Grand Haven, Mich.
Cleveland Tapping Machine Co., 1201 Camden Ave., S. W., Canton 6, Ohio.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

TAPPING MACHINES, Nut

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

TAPS

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O Corp., Detroit 32, Mich.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Jarvis Corp., Middletown, Conn.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Threadwell Tap & Die Co., Greenfield, Mass.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

TESTING EQUIPMENT, Tension, Compression, Fatigue, etc.

Olsen Tinius, Testing Mch. Co., Willow Grove, Pa.

THREAD CUTTING MACHINERY

Brown & harpe Mfg. Co., Providence, R. I.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Coulter, James, Machine Co., Bridgeport 5, Conn.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Eastern Mch. Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Lees-Bradner Co., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. crew Corp., New Haven, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

THREAD GAGES

See Gages, Thread.

THREAD GRINDING MACHINES

See Grinding Machines, Thread

THREAD MILLING MACHINES

Coulter, James, Machine Co., Bridgeport 5, Conn.
Lees-Bradner Co., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Waltham Machine Works, Newton St., Waltham, Mass.

THREAD ROLLING HEADS

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

THREAD ROLLING MACHINES

Landis Machine Co., Waynesboro, Pa.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.

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Bethlehem Steel Co., Bethlehem, Pa.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

(*Continued on page 374*)

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Besley-Welles Corp., 20 N. Wacker Drive, Chicago 6, Ill.
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
du Mont Corp., Greenfield, Mass.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOL BITS, Special Alloy

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DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1200 Woodward Heights Blvd., Ferndale, Mich.

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See Grinding Machines for Sharpening, Turning and Planing Tools

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Portage Double Quick Tool Co., 1063 Sweitzer Ave., Akron 11, Ohio.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. (Turret)
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

TOOL RESINS

Marblette Corp., 37-33 Thirtieth St., Long Island City 1, N. Y.

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Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

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Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
The Atrax Co., (Carbide) 240 Day St., Newington 11, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Colonial Broach Co., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Newcomer Products, Latrobe, Pa.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
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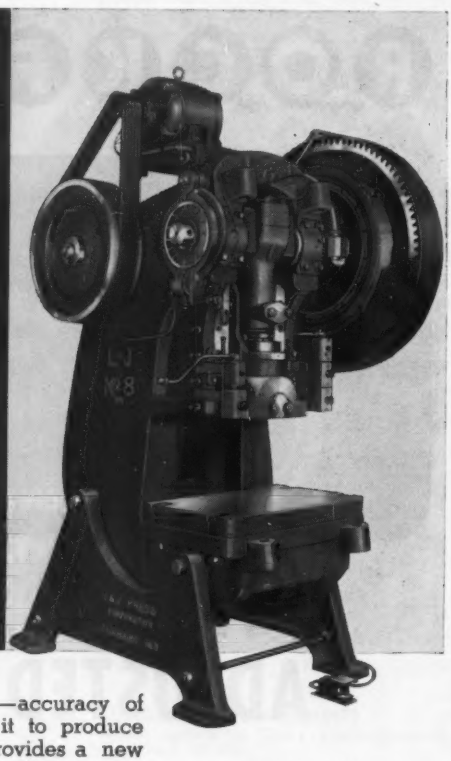

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du Mont Corp. Greenfield Mass.
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Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
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Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
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U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio.

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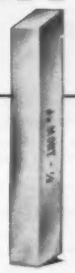
(*Continued on page 376*)

HOW
TOUGH
CAN A
TOOL BIT
BE?



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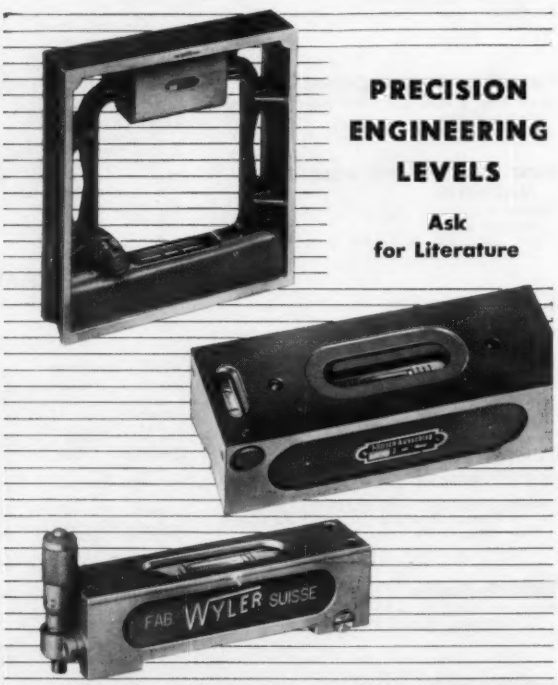

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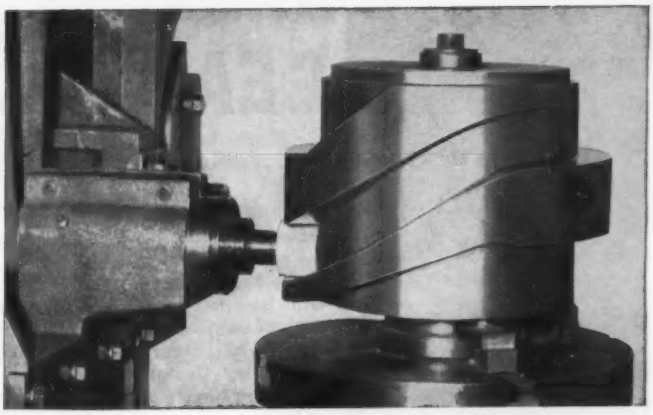

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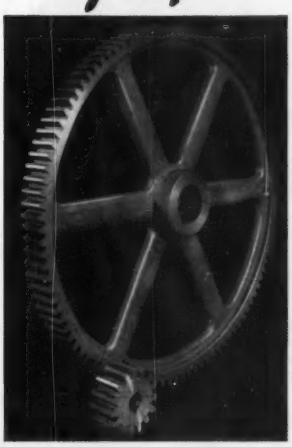

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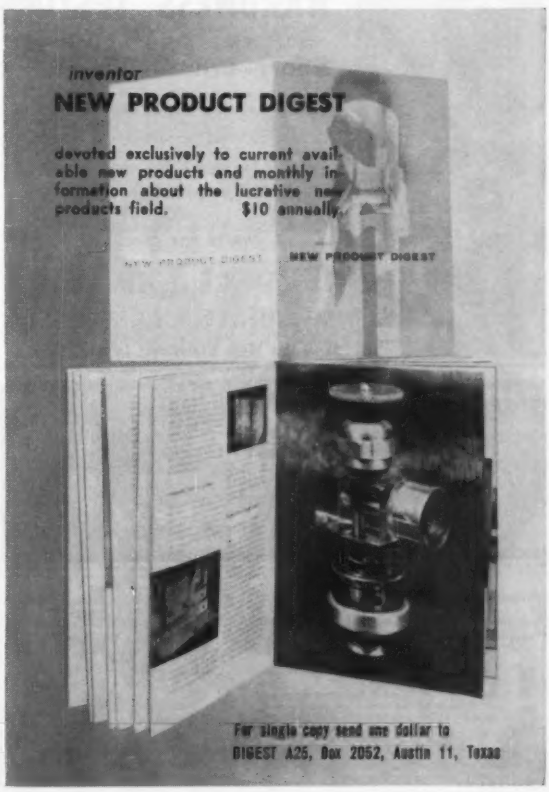
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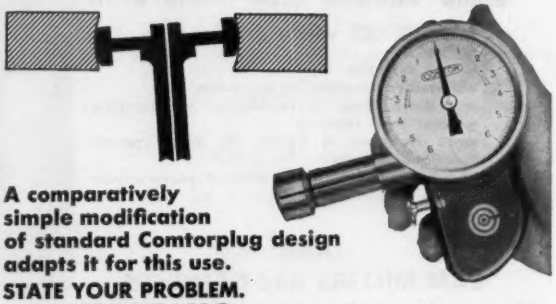

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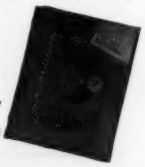

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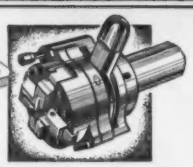

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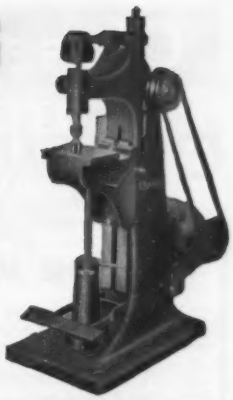

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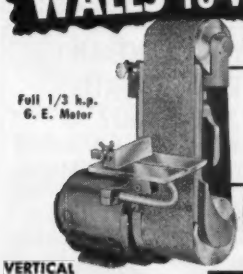

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The listing below is only a VERY SMALL AMOUNT of the total number of machine tools that we have in stock for immediate shipment. Our prices are realistic with today's market and our quality of rebuilding is the same high standard—THE LEADER IN THE FIELD OF REBUILT MACHINE TOOLS.

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No. 121 Hanchett Production Face Grinder, type BB, m.d.
No. 33 Abrasive Vertical, m.d.
14" Pratt & Whitney Vertical, m.d.
No. A-1-8" Arter Surface Grinder
No. 22—12" Heald Rotary, m.d.
#25A-24" Heald Rotary, m.d.
No. 2 Brown & Sharpe, m.d.
#5 Gallmeyer & Livingston, m.d. in base

DISC GRINDERS

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No. 151 Besly, m.d.
Hammond Disc Grinder, Model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
7½ H.P. U.S. Elec. Tool Co. Disc Grinder, m.d., new
14A Gardner Grinder, m.d.
No. 24—53" Gardner Horizontal, m.d.
No. 186—36" cap. Gardner, m.d., latest type
No. 124—53" Gardner Horizontal, m.d.

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6x15" Cincinnati Plain Hydraulic, m.d.
6x18" Cincinnati Model EA, m.d.
6x18" Cincinnati Model ER Plain Hydraulic, m.d., Filmatic Spindle
6x18" Landis Type C Hydraulic, m.d., late
10x18" Cincinnati Model EA, m.d.
10x18" Norton Type C, m.d., latest
10x36" Cincinnati Hydraulic, m.d.
10x36" Norton Type C, m.d.
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis Plain Self-Contained, m.d.
12x96" Landis Plain Self-Contained, m.d.
14x36" Landis Plain Hydraulic, m.d.
14x52" Norton, motorized
16x72" Landis Plain, m.d.
16x72" centers Type C Norton Semi-Auto., Hydraulic
16x96" Cincinnati Plain Cylindrical, m.d.
18x72" Norton Type C, m.d.
No. 20—10x18" Brown & Sharpe, m.d.
20x120" Landis Plain Self-Contained, m.d.

UNIVERSAL GRINDERS

10x24" Landis Type C, m.d.
14x72" Cincinnati Model ER, m.d., latest type, Filmatic Spindle
12x48" Norton Universal, m.d., latest
18x66" Landis Universal, m.d., Type C
14x48" Landis Universal

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No. 3 Niles Cotter & Keyseat Milling Machine, m.d.

HONING MACHINES

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H1 Micromatic Horizontal Hydrohoner, m.d.
H4 Micromatic Horizontal Hydrohoner, m.d.
No. 6 Barnes Twin Spindle
No. 306 H Barnes Single Spindle
No. 224B Barnes Honing Machine, m.d.

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No. 33 Excello, m.d.

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No. 16CR16 Bryant, m.d., latest
No. 16—22" Bryant, m.d., latest
No. 16—38" Bryant, m.d., latest
No. 16-A-28 Bryant, m.d.
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No. 24P—26" Bryant, m.d.
No. 24—21" Bryant, m.d.
No. 24—L-36 Bryant, m.d., late
No. 24-LW-36 Bryant, m.d., late
No. 44 Heald Facing Type Borematic, m.d.
No. 70A Heald, m.d., latest
No. 72 Heald Sizematic, m.d.
No. 72A Heald Sizematic "Duplex," m.d.
No. 72A Heald Gagematic, m.d.
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No. 78 Heald Centerless Cylinder Grinder, m.d.
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No. 81 Heald Plain & Sizematic, m.d.
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GRINDERS, Cyl., Universal, 12" x 48" Norton hydraulic, with internal attachments, new 1941.
GRINDERS, CYLINDRICAL, 6" x 30" Cincinnati E A Filmatic plunge cut (2) 1942-1943.
GRINDERS, SURFACE, 14" x 36" Pratt & Whitney vert spdl., 1942.
GRINDERS, SURFACE, 43" No. 16A2 Blanchard rotary, new 1947.
GRINDERS, SURFACE, 72" No. 72 Hanchett rotary, new 1946.
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Adjustable

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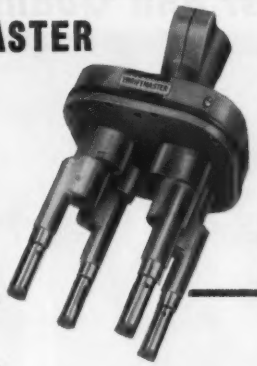

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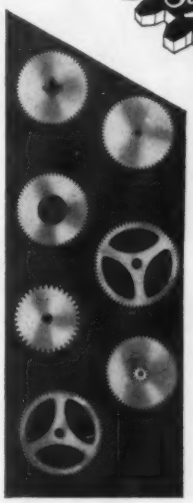

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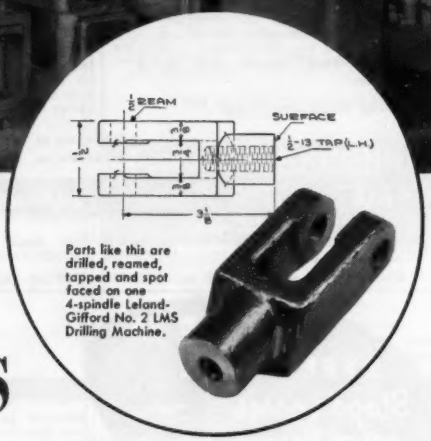
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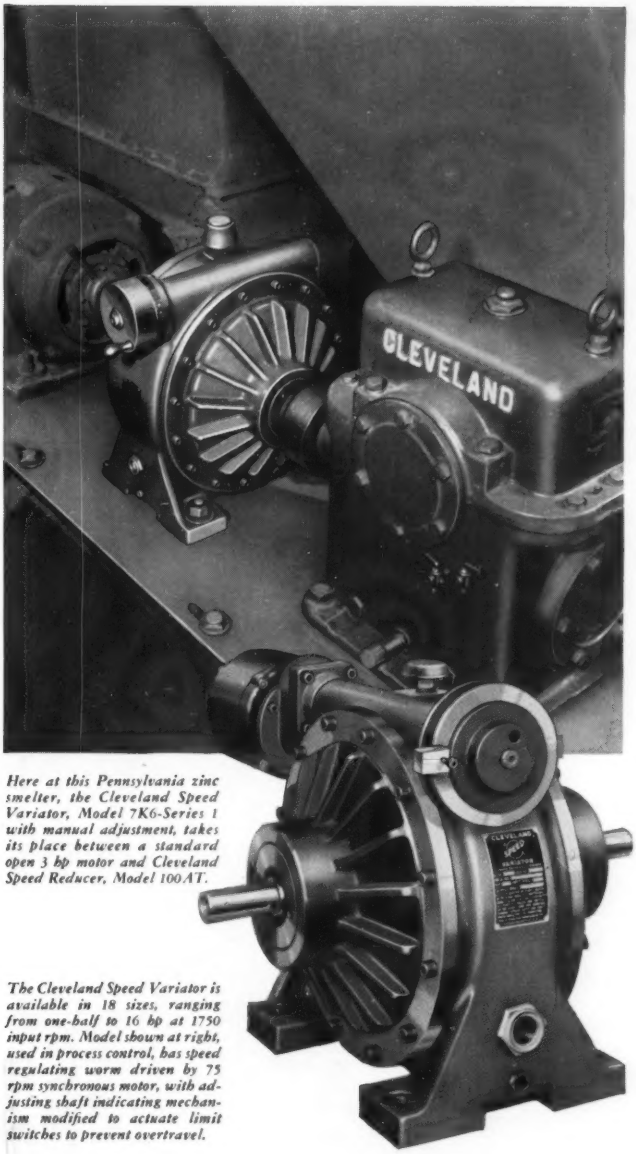
CONTROLS DUST

SEE PANGBORN DUST COLLECTORS IN OPERATION AT BOOTH #906 AT THE 25TH EXPOSITION OF CHEMICAL INDUSTRIES, COMMERCIAL MUSEUM, PHILADELPHIA, PA., DECEMBER 5-9



Here at this Pennsylvania zinc smelter, the Cleveland Speed Variator, Model 7K6-Series 1 with manual adjustment, takes its place between a standard open 3 hp motor and Cleveland Speed Reducer, Model 100AT.

The Cleveland Speed Variator is available in 18 sizes, ranging from one-half to 16 hp at 1750 input rpm. Model shown at right, used in process control, has speed regulating worm driven by 75 rpm synchronous motor, with adjusting shaft indicating mechanism modified to actuate limit switches to prevent overtravel.

CLEVELAND SPEED VARIATOR

adjusts rate of feed of zinc concentrate to hammermill's capacity

DRY, partially roasted, zinc from a new roaster at one of the most important zinc smelters of Western Pennsylvania is fed from the bin to the hammermill by a 12" screw. Delivery to the hammermill must be varied over a wide range as the demand indicates. The easiest way to vary the feed was, of course, to drive the screw at variable speeds—and the Cleveland Speed Variator was selected for the job.

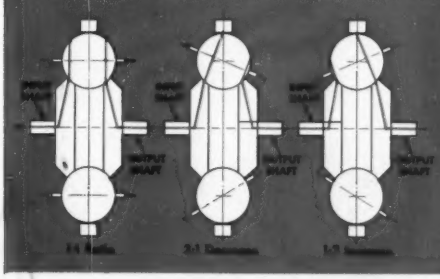
Being infinitely variable, the Cleveland Speed Variator gives stepless speed over a full 9:1 range—from ⅓ to 3 times input speed. Output speed on this application is adjusted by the hand wheel on the Variator—but could be regulated by either manual or automatic remote control.

Available in eighteen standard types and sizes, the Cleveland Speed Variator offers these major advantages:

1. An extremely compact unit with input and output shafts in line and rotating in the same direction.
2. Almost any input speed up to 1800 RPM can be used—either clockwise or counter-clockwise rotation.
3. Rated for constant horsepower output over a 9:1 or 6:1 range; or for constant output torque over a 6:1 range.
4. Speeds infinitely variable over 9:1 or 6:1 range.
5. No slippage—the most positive mechanical variable speed drive available.
6. Long life and minimum maintenance due to absence of belts or complicated linkages.
7. Ample bearing support for overhung pulleys on either input or output shafts.

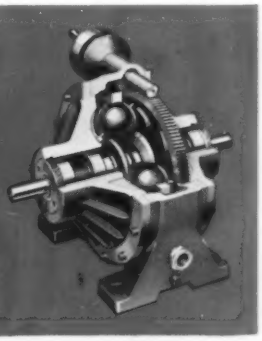
Write for Bulletin K-200 for detailed description with photographs, sectional drawings, rating tables and specifications.

HOW THE CLEVELAND SPEED VARIATOR WORKS



Power is transmitted from input shaft to output shaft through alloy steel driving balls which are in pressure contact with discs attached to the two shafts.

Relative speeds of the shafts are adjusted by changing the positioning of axles on which the balls rotate (see diagrams, left, and cutaway view, right).



THE CLEVELAND WORM AND GEAR COMPANY

Speed Variator Division, 3276 East 80th Street, Cleveland 4, Ohio

Sales Representatives in all major industrial markets • In Canada—Peacock Brothers Limited

Trepans and bores 32-foot gun barrels—TIMKEN® bearings keep huge spindle accurate

THIS Baldwin-Lima-Hamilton NILES A36B boring lathe has a finished weight of 235,680 lbs. and an overall length of 90 feet. It took one year to build and was specifically made to trepan and bore gun barrels as long as 32 feet. To give its huge spindle high accuracy and stability—despite heavy radial and thrust loads and speeds up to 1000 R.P.M.—the spindle was mounted on Timken® tapered roller bearings.

Timken bearings are tapered in construction to take the heavy radial *and* thrust loads this huge spindle gets. Full line contact between rollers and races provides maximum capacity. They maintain spindle precision and accurate gear mesh.

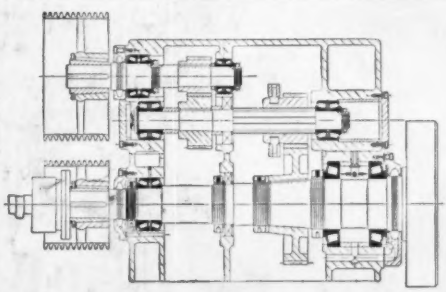
Timken bearings reduce wear because they practically eliminate friction. That's because they're designed by geometrical law to have true rolling motion and made with extreme accuracy so they live up to their design. And they're made of steel we make ourselves: we're the only U. S. bearing maker who takes this extra quality precaution.

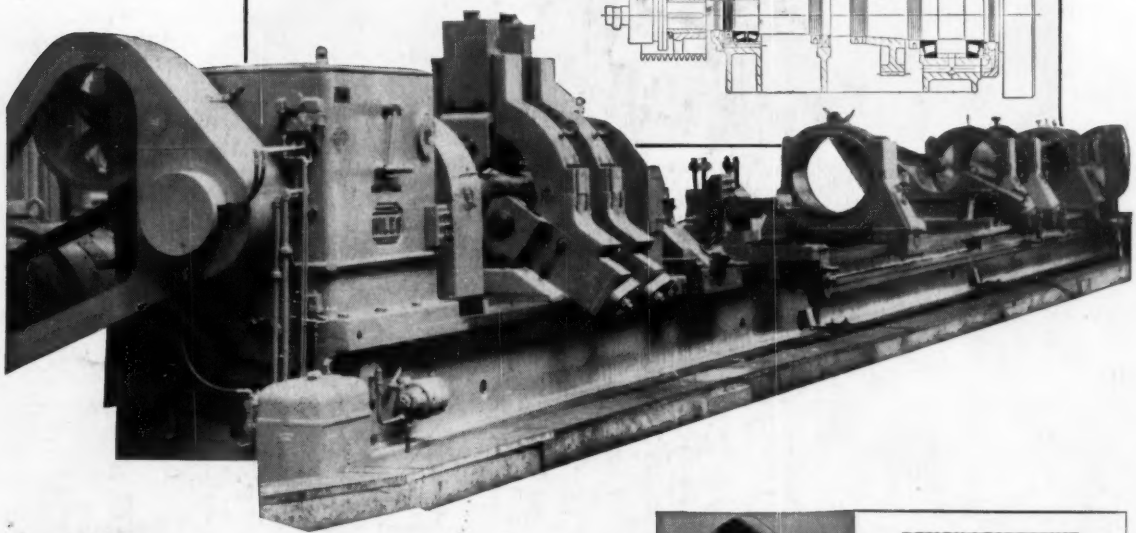
Specify Timken bearings for the machinery you build or buy. Always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

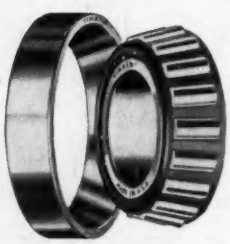
TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.

How **BALDWIN-LIMA-HAMILTON CORPORATION** mounts the spindle of its high-speed NILES boring lathe model A36B on Timken tapered roller bearings to insure less friction, longer life, minimum maintenance.



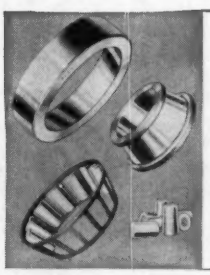




TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



DESIGN LEADERSHIP

The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roller ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

The Timken Company leads in: 1. advanced design: 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION →✳←